CNSE

Central North Sea Electrification (CNSE) Project

Offshore EIA Scoping Report

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CONTENTS

GLOSSARY 4

1 INTRODUCTION 6

2 LEGISLATIVE CONTEXT AND REGULATORY REQUIREMENTS 18

3 PROJECT DESCRIPTION 25

4 APPROACH TO SCOPING AND EIA METHODOLOGY 36

5 STAKEHOLDER CONSULTATION 47

6 PHYSICAL ENVIRONMENT 50

7 WATER AND SEDIMENT QUALITY 73

8 BENTHIC ECOLOGY 90

9 FISH AND SHELLFISH ECOLOGY 116

10 ORNITHOLOGY 142

11 MARINE MAMMALS 158

12 COMMERCIAL FISHERIES 181

13 SHIPPING AND NAVIGATION 198

14 MARINE ARCHAEOLOGY 223

15 OTHER SEA USERS 237

16 SUMMARY OF SCOPING REPORT 251

ACRONYMS 259

GLOSSARY

Term	Description
[Oil and Gas] Asset	Existing central North Sea oil and gas installations to which the Project will provide electricity, namely Elgin (Total Energies), ETAP (bp), Judy (Harbour Energy) and Shearwater (Shell).
Brownfield Scope	Activities required as part of the Marine Scheme occurring within the 500 m safety zone of each of four Assets.
Central North Sea Electrification (CNSE) Consortium	The group of participants currently engaged on the CNSE Project. At the time of writing this includes bp, Harbour Energy, Shell and TotalEnergies. Note that the Project participants may change as the scheme progresses.
CNSE Project (the Project)	Proposed development to provide electrical power to four North Sea oil and gas installations, consisting of an Onshore Scheme and a Marine Scheme.
Greenfield Scope	Activities required as part of the Marine Scheme occurring from Mean High Water Springs to the edge of the 500 m safety zone of each of four Assets.
High Voltage Alternating Current (HVAC) Cables	Distribution power cables between Offshore Converter Station and each Asset.
High Voltage Direct Current (HVDC) Cables	Transmission power cables between the Onshore Converter Station and the Offshore Converter Station.
Jacket	Structure supporting an offshore platform installation: largely below waterline
Marine Scheme	Activities forming part of the Project from Mean High Water Springs, seaward.
Offshore Study Area	Area defined on a receptor by receptor basis, for which a baseline is established.
Marine Survey Area	Area surveyed during site specific surveys.
Offshore Converter Station	Offshore converter station (OCS), consisting of a jacket and topsides, which converts direct current (DC) power to alternating current (AC) power.
Onshore Converter Station	Onshore sub-station which receives AC power from the national grid and convertors this to DC power for offshore transmission.
Onshore Scheme	Activities required as part of the Project from Mean Low Water Springs and extending landward
Project Design Envelope	Maximum design scenario defined for key Marine Scheme components. A degree of flexibility can be built into the application while the potential for significant effects can be established and assessed on a realistic (albeit precautionary) basis
Topsides	The parts of an offshore platform installation above the waterline.
the Applicant	Chrysaor Petroleum Limited, a subsidiary of Harbour Energy plc (hereafter referred to as Harbour Energy), who are currently providing operator services in this phase of the

Term	Description
	Project, on behalf of the CNSE Consortium. Current participants in the Consortium include bp, Harbour Energy, Shell and TotalEnergies.
500 m safety zone	An area around an offshore oil and gas installation extending 500 m from any part of the installation. Governed by The Petroleum Act 1987 and vessels of all nations are required by law to respect them. It is an offence (under section 23 of the Petroleum Act 1987) to enter a safety zone except under special circumstances.

1 INTRODUCTION

The Central North Sea Electrification (CNSE) Project is a collaborative venture between bp, Harbour Energy, Shell and TotalEnergies (hereafter referred to as 'the Applicant') which aims to contribute to the decarbonisation of the offshore energy sector through the electrification of existing oil and gas infrastructure in the central North Sea (CNS).

1.1 Project Overview

The CNSE Project will deliver a significant reduction in Greenhouse Gas (GHG) emissions and lower the carbon intensity of oil and gas produced from connected Oil and Gas platforms (hereafter referred to as 'the Assets'). This will be achieved by either full or partial electrification of combustion equipment that is used to generate power for platform facilities.

The Project will provide power to a cluster of CNS Assets. The number of participating Assets is expected to change during the next phase of the Project. Current participants are named as:

- Eastern Trough Area Project (ETAP) (bp);
- Elgin (TotalEnergies);
- Judy (Harbour Energy); and
- Shearwater (Shell).

The CNSE Project is expected to be a 220 MW High Voltage Direct Current (HVDC) Power from Shore system designed to offtake and distribute power from the national grid to a central Offshore Convertor Station (OCS). Thereafter the power from the OCS will be distributed onward to each connected asset via a radial network of High Voltage Alternating Current (HVAC) Cables.

As depicted in Figure 1-1, the following infrastructure will be required:

- An onshore convertor station;
- 80 kV HVDC Cabling system from the onshore convertor station to the landfall (length ~5 km);
- 80 kV HVDC Cabling system from the landfall1 to the offshore convertor station (length ~225 km);
- An OCS; and
- 66 kV HVAC Cabling from the OCS to each participating CNSE asset (total length ~185 km).

[1] *The landfall location is the point where HVDC Cables will be brought to shore or be installed from shore, depending on chosen installation method. The landfall is a key interface between the Marine Scheme and the Onshore Scheme and three potential location options are proposed for the CNSE Project along the coastline of Aberdeenshire, one at Sandford Bay, Peterhead and two at Longhaven (discussed further in Section 3.5.3).*

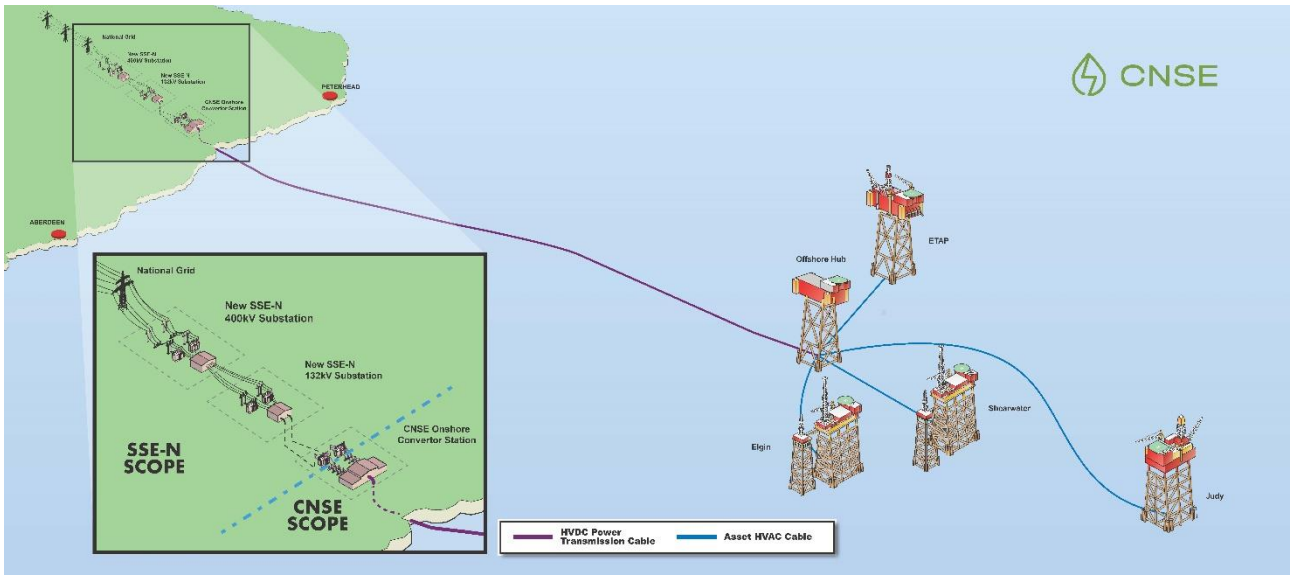

Figure 1-1 CNSE Project overview

The CNSE Project comprises two distinct proposals, or 'Schemes', the Marine Scheme and the Onshore Scheme.

Marine Scheme: Works associated with the CNSE Project seaward of Mean High Water Springs (MHWS) (including the installation of the offshore HVDC Cables, the OCS, and the installation of the offshore HVAC Cables from the Convertor Station to the Assets) are considered under the Marine Scheme. The assessment of potential impacts arising from the Marine Scheme are considered as part of this Scoping Report which has been prepared in support of a formal request for a Scoping Opinion to Marine Directorate Licensing and Operations Team (MD-LOT).

Onshore Scheme: Works associated with the CNSE Project landward of MLWS (including the installation of an onshore HVDC Cables and an Onshore Convertor Station) are considered under the Onshore Scheme. The assessment of potential impacts arising from the Onshore Scheme are not considered within this Scoping Report and will be assessed as part of a separate Scoping Report which will be submitted to Aberdeenshire Council in support of a formal request for an Environmental Impact Assessment (EIA) Scoping Opinion.

The extent of the Marine Scheme and Onshore Scheme in relation to one another is shown in Figure 1-2.

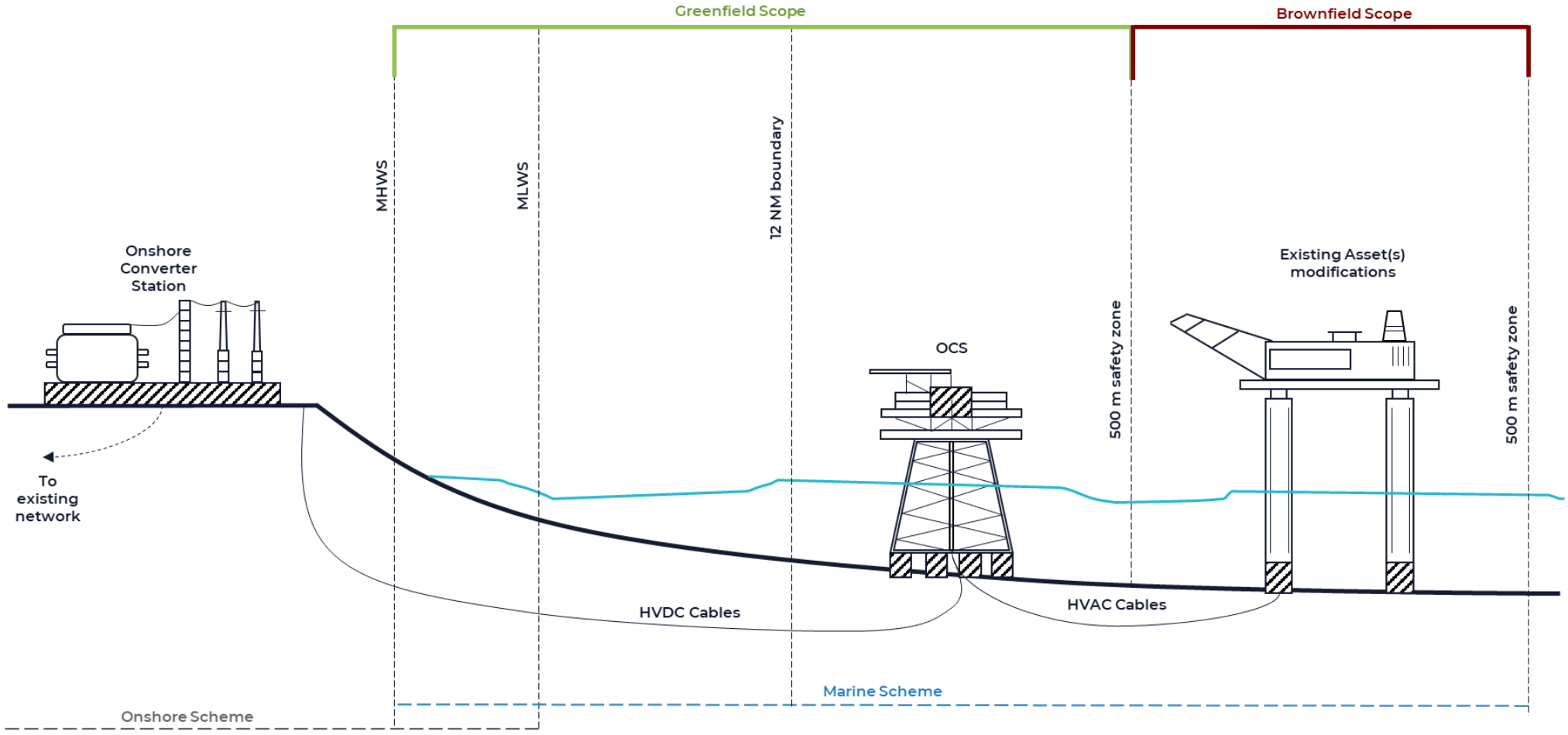

Figure 1-2 Schematic of the CNSE Project. Note: OCS, Offshore Converter Station.

Further defined within the Marine Scheme, are two elements:

- The Greenfield Scope, which includes all activities required as part of the Marine Scheme occurring from MHWS to the edge of the 500 m safety zone of each of the four Assets.
- The Brownfield Scope, which consists of HVAC Cable installation (including seabed preparation and cable protection), operations and maintenance and decommissioning within the 500 m safety zone of each of four Assets. At two of the four Assets, a bridge-linked platform (BLP) may be installed adjacent to the existing facility to provide power conversion infrastructure.

The CNSE Project boundaries, and the interfaces between the Greenfield and Brownfield Scopes are shown in Figure 1-2. Figure 1-3 provides an overview of the location and extent of the CNSE Project Marine Scheme in the wider regional context.

This Scoping Report encompasses the Greenfield Scope and also considers elements of the Brownfield Scopes. The Brownfield Scope elements and associated scoping questions are presented under separate section headings to enable clear scope differentiation.

Respondents to the Scoping Report are requested to separate out comments relating to the Greenfield Scope from those relating to the Brownfield Scope to ensure the comments can be appropriately addressed.

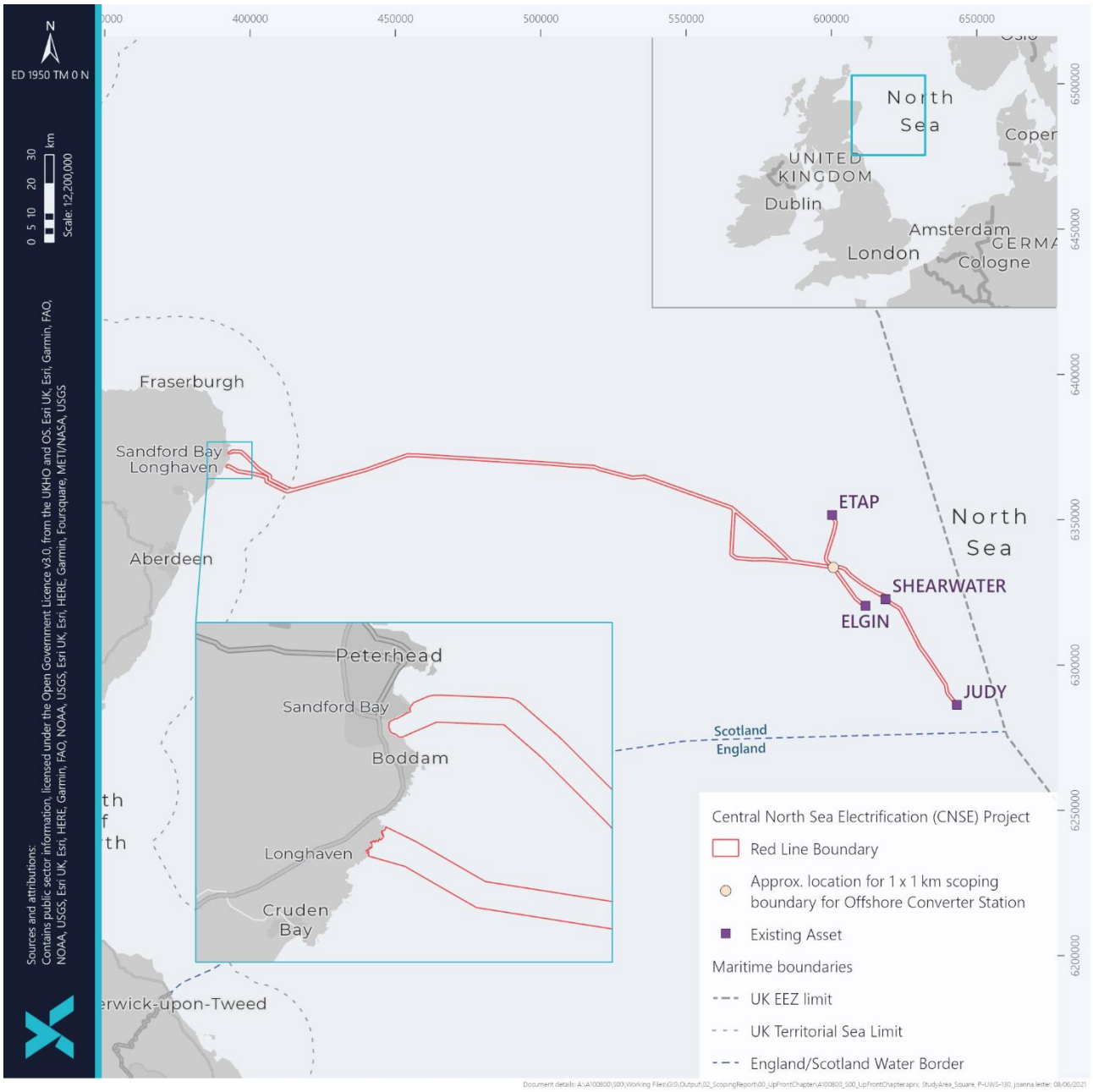

Figure 1-3 Overview of the CNSE Project Marine Scheme

1.1.1 Strategic Need for the Project

It is recognised that the UK's future energy generation mix will come from a range of sources including renewables, nuclear, low carbon hydrogen; with residual use of unabated natural gas and crude oil fuels for heat, electricity, transport, and industrial applications, as the energy transition occurs (BEIS, 2021a).

GHG emissions from UK continental shelf (UKCS) upstream oil and gas activity accounted for 4% of net UK GHG emissions in 2020, equating to 15.3 million tonnes of CO_2e (NSTA, 2022). Consequently, the UK oil and gas sector

has an important role to play in the national transition to Net Zero and opportunity to demonstrate industry commitment to the North Sea Transition Deal 2021 (NSTD) of reducing associated GHG emissions by 50%, compared to a 2018 baseline, by 2030. The North Sea Transition Deal (BEIS, 2021b) introduced a sector deal between the UK government and the offshore oil and gas industry ('the sector deal'). The sector deal supports and anchors the expert supply chain that has built up around oil and gas in the UK, to both safeguard and create new high-quality jobs. The sector deal will transform the oil and gas industry in preparation for a net zero emissions future and catalyse growth throughout the UK economy ensuring a just transition of the energy sector.

Of the total UKCS upstream oil and gas emissions, 71% was attributed to combustion of hydrocarbons for power generation between 2018 and 2020 (with the reminder comprising mostly flaring and venting emissions). The CNSE Project therefore aims to reduce emissions associated with power generation on participating offshore installations by replacing fuel gas (hydrocarbon) combustion for power generation (and/or platform compression) with national grid power from shore. Such platform electrification has been noted as "essential" to achieving decarbonisation at the scale and pace required to meet the NSTD 2030 reduction target e.g. NSTA (2020) and OEUK (2022).

Decarbonisation of offshore installations also addresses the challenge from North Sea Transition Authority (NSTA, UK O&G Industry regulatory body) to maximise hydrocarbon economic recovery while supporting the UK Net Zero Targets of 2050. OGA Stewardship Expectation 11 (SE11[2], NSTA) requires the industry to reduce GHG emissions from upstream operations 'as far as reasonable' and failure to reduce emissions may threaten the sector's social licence to operate. The CNSE Project therefore supports the UKs Net Zero emissions strategy whilst supporting the UK energy transition pathway[3].

1.2 Consenting Strategy

The Marine Scheme is located within both Scottish Territorial Waters (0-12 nautical miles (NM)) and the Scottish Economic Exclusive Zone (EEZ) (12-200 NM). As such, Scottish Ministers are the relevant decision makers regarding the necessary offshore consents and licences required for the installation, operation and maintenance and decommissioning of the Marine Scheme. The primary consents and licences that are required for the Marine Scheme include Marine Licences (ML) under the Marine and Coastal Access Act (MCAA) 2009 for the OCS and the portion of the HVDC and HVAC Cables beyond the 12 NM limit, and under the Marine (Scotland) Act 2010 for the part of the HVDC Cables which are within 12 NM of the coast, including landfall operations up to MHWS.

To allow Scottish Ministers to consider the Marine Scheme proposal, applicants are required to provide information which demonstrates compliance with the relevant legislation and policy (as outlined in Section 2) and allows adequate understanding of material considerations. This will be documented in an Environmental Impact Assessment Report (EIAR).

The overall EIA process is delivered through a number of defined stages (namely, scoping, environmental assessment, planning and monitoring). The approach to scoping and EIA methodology is outlined in Section 4. The outcome of the EIA process will culminate in the creation of an EIAR.

[2] https://www.nstauthority.co.uk/media/7184/se11_net-zero.pdf
[3] https://www.nationalgrideso.com/future-energy/future-energy-scenarios

This Scoping Report has been prepared to support a request for a Scoping Opinion from MD-LOT, per Part 4, Regulation 14 of the Marine Works EIA (Scotland) Regulations 2017 and Part 3, Regulation 13 of the Marine Works EIA Regulations 2007 (as amended). The Scoping Report aims to determine the scope of the EIA for the Marine Scheme and outlines the proposed approach to EIA.

1.3 Document Structure

This structure of this Scoping Report is presented in Table 1-1, providing an overview of the information presented within each section.

Table 1-1 Document structure

Chapter	Overview
1. Introduction	This Section provides an introduction to the Applicant and the Marine Scheme, outlining the objectives of this Scoping Report and the approach to consenting strategy. Scoping questions are presented.
2. Legislative context and regulatory requirements	This Section outlines the relevant legislative and policy context for the Marine Scheme.
3. Project description	This Section provides an overview of the Marine Scheme and describes the key components.
4. Approach to scoping and EIA methodology	This Section outlines the approach to scoping, as adopted for this Scoping Report and presents the proposed methodology for the EIA.
5. Stakeholder consultation and engagement	This Section outlines stakeholder consultation and engagement undertaken to date and the proposed approach to future consultation.
6. Physical environment	Receptor specific sections will present: • A characterisation of the existing baseline environment; • Identify embedded mitigation; • Scoping of potential impacts; • Identification of potential cumulative and transboundary impacts; • An outline of the proposed approach to EIA; and • Consideration of the Brownfield Scope.
7 Water and sediment quality	
8. Benthic ecology	
9. Fish and shellfish ecology	
10. Ornithology	
11. Marine mammals	
12. Commercial fisheries	

Chapter	Overview
13. Shipping and navigation	
14. Marine archaeology	
15. Other sea users	
16. Summary of Scoping Report	This Section summarises the approach taken within this Scoping Report and the key findings of the report (i.e., the potential impacts scoped in for further assessment within the EIA).

1.4 Scoping Questions

Table 1-2 and Table 1-3 outline the Greenfield and Brownfield scoping questions relating to each Section of this Scoping Report. The Applicant requests responses from stakeholders to these questions. A cross-reference to the tables is made at the end of each Section, highlighting the relevant questions for consideration.

Table 1-2 CNSE Scoping Report Greenfield Scoping Questions

Question Number	Question	2. Legislation	3. Project Description	4. Approach to Scoping and EIA Methodology	5. Stakeholder Consultation	6. Physical Environment	7. Water and Sediment Quality	8. Benthic Ecology	9. Fish and Shellfish Ecology	10. Ornithology	11. Marine Mammals	12. Commercial Fisheries	13. Shipping and Navigation	14. Marine Archaeology	15. Other Sea Users
1	Do you agree with the overall regulatory approach and consenting strategy for the CNSE Project? As explained in detail within this Scoping Report, the Applicant understands that per current legislative requirements for this scheme, an ML is required for cable laying, cable maintenance, cable protection and cable removal in both inshore and offshore waters. The Applicant understands that OCS installation, operations and maintenance, and decommissioning requires an ML offshore.	✓													
2	Do you agree that the HVDC Cables and HVAC Cables associated with the Marine Scheme are defined as submarine cables that are constructed or used in connection with the exploitation of natural resources of the UK sector of the continental shelf, per Section 81(5) of MCAA 2009?	✓													
3	Do you agree with the inclusion of a pre-application consultation report to accompany the ML application? Do you agree with the broad details of consultation and engagement which will support this? If you have specific suggestions and requests for the pre-application consultation report, please provide them as part of your response.	✓			✓										
4	Can MD-LOT confirm the guidance to use to inform the approach to Nature Conservation Marine Protected Area assessment given withdrawal of the draft management handbook.			✓				✓							
5	Seabed leasing: please confirm a) which licensing authority will grant property rights for seabed leasing beyond 12 NM b) under which regulatory regime these property rights will be granted?	✓													
6	Do you agree with the broad details of the proposed EIA methodology?			✓											
7	Do you agree with topic-specific methodologies where they have been detailed within the Scoping Report?					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
8	Do you agree with the Study Area which the Applicant has defined for each of the topic-specific assessments? If you do not agree, please provide your suggested revisions and rationale.					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
9	Do you agree that all the available data and information sources have been identified to inform the baseline for each of the topic-specific assessments? Are there any additional data and information sources that should be considered?					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Question Number	Question	2. Legislation	3. Project Description	4. Approach to Scoping and EIA Methodology	5. Stakeholder Consultation	6. Physical Environment	7. Water and Sediment Quality	8. Benthic Ecology	9. Fish and Shellfish Ecology	10. Ornithology	11. Marine Mammals	12. Commercial Fisheries	13. Shipping and Navigation	14. Marine Archaeology	15. Other Sea Users
10	Do you agree with the embedded mitigation measures which the Applicant has identified in each of the topic-specific sections of the Scoping Report?					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
11	Do you agree with the conclusions of impacts which have been scoped in or scoped out?					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
12	Do you agree with the scoping assessment of potential cumulative effects? Are there specific interactions which you would like to flag to the Applicant as being of specific interest?					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
13	Do you agree with the scoping assessment of potential transboundary impacts?					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
14	Do you agree with the proposed list of consultees for each of the topic-specific assessments? Where there are additional consultees who you would like to recommend, please supply details as part of your response					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
15	Do you agree that all reasonable receptors and impacts have been identified by the CNSE Project?			✓											

Table 1-3 CNSE Scoping Report Brownfield Scoping Questions

Question Number	Question	2. Legislation	3. Project Description	4. Approach to Scoping and EIA Methodology	5. Stakeholder Consultation	6. Physical Environment	7. Water and Sediment Quality	8. Benthic Ecology	9. Fish and Shellfish Ecology	10. Ornithology	11. Marine Mammals	12. Commercial Fisheries	13. Shipping and Navigation	14. Marine Archaeology	15. Other Sea Users
1	The Applicant notes that the Brownfield Scope covers an area that is less than 0.2% of the area covered by the overall Greenfield Scope. • Will the ML for Brownfield Scope require an EIA under The Marine Works (Environmental Impact Assessment) Regulations 2007? • Would a slimline EIA approach/ environmental assessment be suitable to support the ML application for the Brownfield Scope, tailored to support each Asset's ML application? • Please confirm whether the requirement for EIA/environmental assessment will be different a) if the ML relates to BLP installation, operation and maintenance and decommissioning and b) if the ML relates to BLP installation, operation and maintenance and decommissioning where the BLP incorporates additional oil and gas processing equipment.	✓		✓											

Question Number	Question	2. Legislation	3. Project Description	4. Approach to Scoping and EIA Methodology	5. Stakeholder Consultation	6. Physical Environment	7. Water and Sediment Quality	8. Benthic Ecology	9. Fish and Shellfish Ecology	10. Ornithology	11. Marine Mammals	12. Commercial Fisheries	13. Shipping and Navigation	14. Marine Archaeology	15. Other Sea Users
2	The Applicant will submit the ML application for the Greenfield Scope. Individual operators will be responsible for works within the 500 m safety zone of each Asset. An ML application will be submitted per Asset for the Brownfield Scope by each relevant operator. Do you agree with this approach given the responsibility of different operators for works within different 500 m safety zones and the likely differing timelines associated with execution of the Greenfield and individual Brownfield Scopes	✓													
3	Will MD-LOT be the regulator to issue a ML to each applicant under the MCAA for the Brownfield Scope?	✓													
4	Do MD-LOT agree with the Brownfield Scoping boundary: • For two of four Assets where BLPs may be installed, the CNSE current understanding is that the boundary is inclusive of BLP installation, operation and maintenance and decommissioning but exclusive of any oil and gas processing equipment (new or modified); • For two of four Assets where electrification is anticipated to involve new and/or modified power conversion equipment (and no BLP installation), the boundary occurs where the HVAC Cable transitions from the seabed onto each Asset.		✓	✓											
5	Do you agree that the receptors indicated by a tick can be scoped out of further assessment associated with the Brownfield Scope?	✓	✓		✓	✓		✓	✓		✓	✓	✓	✓	
6	For benthic ecology specifically: • Do you agree that all available information and data sources have been identified to inform the baseline within the Brownfield Scope? Are there any other information and data sources that should be considered? • Do you agree with the scoping decisions of potential impacts with regards to the Brownfield Scope? • Do you agree with the scoping out of potential cumulative impacts with regards to the Brownfield Scope? • Do you agree with the scoping out of potential transboundary impacts with regards to the Brownfield Scope? • Do you agree with the proposed approach to EIA methodology?			✓											
7	Do you agree that marine mammal receptors can be scoped out of further assessment associated with the Brownfield Scope, with the exception of the potential impact on marine mammal receptors associated with impact piling during BLP installation?										✓				
8	Do you agree that any additional risk to shipping and navigation receptors can be considered via assessments which support variation of the existing Consent to Locate granted under Part 4A of the Energy Act 2008?												✓		

1.5 References

HM Government. 2023. Powering Up Britain: Energy Security Plan. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1148252/powering-up-britain-energy-security-plan.pdf

NSTA. 2020. UKCS Energy Integration: Final Report Annex 1. Offshore Electrification. Available online at: https://www.nstauthority.co.uk/media/6629/ukcs_energy_integration_annex-1-offshore-electrification-final-august-2020.pdf

NSTA. 2022. Emissions Monitoring Report. Available online at: https://www.nstauthority.co.uk/media/8439/emr-2022-final-v2.pdf

OEUK. 2022. Emissions Report 2022: Delivering on our commitment: scenarios for decarbonising oil and gas production. Available online at: https://oeuk.org.uk/wp-content/uploads/woocommerce_uploads/2022/10/OEUKs-Emissions-Report-2022-d3g68p.pdf

2 LEGISLATIVE CONTEXT AND REGULATORY REQUIREMENTS

The following Section outlines the key policy and legislation of relevance to the Marine Scheme. Relevant policy, legislation and guidance will be expanded on within the EIA in a dedicated chapter and in a section within each topic/receptor specific chapter.

2.1 Climate Change

2.1.1 International Commitments

The United Nations Framework Convention on Climate Change, signed in 1992, is an international treaty for addressing climate change. The Convention was primarily designed to support the development of future agreements, protocols, and amendments that would impose obligations and enforceable requirements to reduce GHG emissions.

The UK is a signatory to the Kyoto Protocol which commits member nations to reductions in GHG emissions by setting internationally binding emissions reductions targets. The Kyoto Protocol came into effect in 2005, and commitments were transposed into UK law by the Climate Change Act 2008.

Under the United Nations Framework Convention on Climate Change, the Paris Agreement is a legally binding international treaty that aims to limit global warming to less than 2°C and pursue efforts to limit it to 1.5°C. The Agreement is the first legally binding global climate change agreement and was adopted by 196 Parties at COP21 in Paris. It entered into force on 4th November 2016.

2.1.2 National Legislation and Policy

In the UK and Scotland, there is a range of national legislation, policies and targets which relate to reducing GHG emissions and tackling climate change. These include:

- The Climate Change Act 2008 which was revised by the Climate Change Act 2008 (2050 Target Amendment) Order 2019. This revision includes a reduction of all GHG to 'net zero' by 2050.
- The Climate Change (Scotland) Act 2009 which targets achievement of net zero by 2045 through interim reductions in emissions of at least 75% by 2030 and 90% by 2040.
- The Energy Act 2013 which aims to reform the electricity market for the purposes of encouraging low carbon electricity generations or through ensuring the security of energy supply.
- The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 which sets targets for the reductions of greenhouse gas emissions;
- The Scottish Energy Strategy which sets out a vision for the energy system in Scotland until 2050 (Scottish Government, 2023a).
- The Energy White Paper "Powering our Net Zero Future" describes how the transition to clean energy can be achieved by 2050. The North Sea Transition Authority (NSTA, then the Oil and Gas Authority, OGA) revised the oil and gas sector specific "Maximising Economic Recovery Strategy" in February 2021 to support net zero ambitions, including the following central obligation with underpinning requirements:

"Relevant persons must, in the exercise of their relevant activities, take the steps necessary to:
…. assist the Secretary of State in meeting the net zero target, including by reducing as far as reasonable in the circumstances greenhouse gas emissions from sources such as flaring and venting and power generation, and supporting carbon capture and storage projects."

- The North Sea Transition Deal (BEIS, March 2021) introduced a sector deal between the UK government and the offshore oil and gas industry. This aims to transform the sector in preparation for a net zero emissions future and catalyse growth throughout the UK economy ensuring a just transition of the energy sector. Platform electrification is seen as critical to meeting North Sea Transition Deal targets i.e., absolute reduction in production emissions of 10% in 2025, 25% in 2027, and 50% in 2030.
- Stewardship Expectation 11 (NSTA, 2021) provides the OGA's view as to how the oil and gas sector should manage existing and new developments to lower GHG emissions and contribute to achieving the UK's 2050 net zero target. Electrification is a particular target.

2.2 Marine Consenting Legislation

The Marine (Scotland) Act 2010 (MSA 2010) applies to Scottish Territorial Waters (between 0 and 12 NM from MHWS) and Part 4, Section 21 of the Act defines the marine licencing requirements for cables. Equally, Part 4, Section 21 of the Marine and Coastal Access Act (MCAA) 2009 applies between the 12 and 200 NM limit.

As the Marine Scheme is both within and beyond the 12 NM limit, an ML under both sets of legislation will be required. The ML application will be made to MD-LOT.

The Marine Licencing (Pre-application Consultation) (Scotland) Regulations 2013 ('PAC Regulations') requires that cables longer than 1853 m and which cross the intertidal boundary should be subject to pre-application consultation requirements. In accordance with the PAC Regulations and associated guidance from MD-LOT (MS-LOT, 2022) these requirements only apply in respect of relevant applications in the Scottish Inshore Region (i.e. from MHWS to the 12 NM limit).

Table 2-1 Marine Licence requirements from MD-LOT

Activity	MHWS – 12 NM	12 NM – 200 NM
	Marine (Scotland) Act 2010	Marine and Coastal Access Act 2009
Cable Laying	ML	ML
Cable Maintenance	ML	ML
Rock Mattressing/Protection	ML	ML
Cable Removal	ML	ML
OCS Installation, Operation and Maintenance, Decommissioning	N/A	ML

The Marine Scheme lies within the boundary of Peterhead Harbour area. Consultation will be conducted with Peterhead Port Authority to ascertain any works licencing requirements under the Harbours Act 1964 and the Peterhead Harbours Order Confirmation Act 1992 (as amended).

2.2.1 Brownfield Scope

The majority of activity associated with oil and gas exploration and production are regulated by the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED).

As stated above, Part 4 of MCAA 2009 details the provisions relating to marine licensing. Section 77 of MCAA excludes offshore energy activities relating to oil and gas exploration and production with further exemptions contained within Marine Licensing (Exempted Activities) Order 2011 (as amended).

OPRED guidance states *"Activities not specifically excluded from the licensing provisions or exempted under the Marine Licensing (Exempted Activities) Order 2011 must be the subject of a marine licence issued by OPRED, unless the proposals fall to be regulated by the DAs [Delegated Authorities]. Activities that may require a licence can include..... the deposit or removal of certain cables, e.g., telecommunications, power or control cables not covered by a PWA"*[4] (i.e., a Pipeline Works Authorisation).

The Applicant will submit the ML application for the Greenfield Scope. Individual operators will be responsible for works within the 500 m safety zone of each Asset. It is proposed that an ML application will be submitted per Asset for the Brownfield Scope by each relevant operator. Each application will be supported by the environmental assessment contained within the EIAR.

2.3 Environmental Impacts Assessment (EIA) Regulations

Requirements for EIA are defined in the EIA Directive (85/337/EEC codified by EIA Directive 2011/92/EU and then amended by EU Directive 2014/52/EU) which has been transposed into both UK and Scottish Law. The purpose of the EIA Directive is to ensure that the potential effects of a project on the environment are taken into consideration before consent is granted. If a project is deemed to have the potential to result in significant effects on the environment by virtue of factors such as the size or location, then an EIA is required. The results from an EIA must be provided by the Applicant to a decision maker in the form of an Environmental Impact Assessment Report (EIAR).

The requirements of the EIA Directive are transposed into UK law through the following key regulations:

- The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) which apply from MHWS to 12 NM;
- The Marine Works (EIA) Regulations 2007 (as amended) which apply from 12 NM to 200 NM.

[4] *https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005109/The_Offshore_Oil_and_Gas_Exploration__Production__Unloading_and_Storage__Environmental_Impact_Assessment__Regulations_2020_-_A_Guide__July_2021.pdf*

Collectively these regulations are referred to as the 'EIA Regulations'. The EIA Regulations outline the statutory process and minimum requirements for an EIA. The EIA Regulations apply independently; however, they are often applied in parallel with other, associated, regulation, including The Conservation (Natural Habitats &c.) Regulations 1994 (as amended) and the Conservation of Offshore Marine Habitats and Species Regulations (2017). The EIAR shall be prepared in accordance with the Marine Works (EIA) (Scotland) Regulations 2017 (as amended), and the Marine Works (EIA) Regulations 2007 (as amended).

Subsea cable installation is not a Schedule AI or Schedule A2 project under the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) or the Marine Works (EIA) Regulations 2007 (as amended). Installation of a single OCS in the 12 – 200 NM offshore area is not a Schedule AI or A2 project under the Marine Works (EIA) Regulations 2007 (as amended). Therefore, the Applicant is not required to undergo the EIA process and produce an EIAR. However, to support the ML application(s) and align with good practice, the Applicant is volunteering to conduct a statutory EIA in support of the application(s). The Applicant has discussed the approach to EIA and ML application with MD-LOT (Section 5).

2.4 Marine Planning

2.4.1 UK Marine Policy Statement

The UK Marine Policy Statement (MPS) was prepared and adopted for the purposes of Section 44 of the Marine and Coastal Access Act 2009. The MPS aims to contribute to the achievement of sustainable development within the UK marine area. The UK MPS is implemented throughout the UK via marine plans which provide detailed policy and spatial guidance, contributing to the overall aims of the UK Marine Policy Statement. The UK MPS explains the high levels aims of the Marine Strategy Framework Directive (MSFD)[5] which aims to reverse threats to the marine environment and phase out marine pollution.

2.4.2 National Marine Plan for Scotland

The management of Scottish inshore (0 to 12 NM) and offshore (between 12 NM and 200 NM) waters is covered under the National Marine Plan for Scotland (Scottish Government, 2015). Published in 2015, the plan aims to 'integrate both the ecosystem approach and the guiding principles of sustainable developments to deliver a robust approach to managing human impact on Scotland's Seas' (Scottish Government, 2015).

The plan covers eleven Regional Marine Plans (RMP) which are to be implemented at a local level, extending out to 12 NM. The Marine Scheme is entirely within the North East region, noting that at the time of writing, there is no RMP in place for the region.

[5] *This was transposed into UK law under the Marine Strategy Regulations 2010.*

2.5 The Habitats Regulations

The Council Directive 92/43/EEC (the Habitats Directive) (1992) aims to maintain or restore natural habitats and wild species listed on the Annexes to a favourable conservation status.

The European Directive (2009/147/EC) on the conservation of wild birds (The Birds Directive) provides a framework for the conservation and management of wild birds throughout Europe. The Directive affords protection to rare and vulnerable bird species listed under Annex I of the Directive. This protection is provided through the identification and designation of Special Protection Areas (SPAs).

These Directives have been transposed into UK and Scottish Law through a number of regulations. The regulations considered relevant to the Marine Scheme include:

- The Conservation (Natural Habitats &c.) Regulations 1994 (as amended); and
- The Conservation of Offshore Marine Habitats and Species Regulations 2017.

These regulations are hereafter known as the 'Habitats Regulations'.

On the 31st January 2020, the UK left the European Union as a Member State. The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 and the Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019 afford protection through the designation of a UK national site network (previously granted through European Sites).

The Habitats Regulations (as amended) enable the protection of sensitive sites which are associated with habitats and species of European value and importance. These sites, summarised below, are collectively referred to as the national site network (formerly European Sites). The national site network includes Ramsar sites (which were not formerly covered by the Regulations but are now included as a result of guidance in the 4th National Planning Framework (Scottish Government, 2023b). Sites included in the national site network are:

- Special Areas of Conservation (SAC);
- Special Protection Area (SPA); and
- Ramsar Sites.

The Habitats Regulations Appraisal (HRA) process forms part of the Habitats Regulations. The HRA process requires that any plan or project which have the potential to result in a Likely Significant Effect (LSE) to a site designated as part of the national site network or its designated features, should be subject to a HRA by the Competent Authority and, if necessary, an Appropriate Assessment (AA). Through this process, the Competent Authority will establish the potential or extent of an adverse effect on the integrity of a designated site in view of its conservation objectives. A sufficient level of detail on the Marine Scheme and its potential impacts on the national site network will be provided to the Competent Authority by the Applicant to allow the Competent Authority to undertake the HRA and (if necessary) AA. The Applicant will carry out a detailed screening for potential LSE following the submission of this Scoping Report.

The Applicant will work with the relevant Competent Authority (Authorities where overlap exists between the Onshore Scheme and the Marine Scheme) to support fulfilment of the regulatory obligations on the Competent Authority.

2.6 Marine Protected Areas Assessment

Nature Conservation Marine Protected Areas (NCMPAs) are designated under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act (MCAA) 2009 in Scottish inshore and offshore waters respectively. It is through these Acts that MD-LOT are required to consider whether an activity, plan or development has the potential to affect (other than insignificantly) a qualifying feature of an NCMPA or any ecological or geomorphological process upon which the conservation objectives of the site is dependent[6].

The EIAR will include an assessment of any impacts on NCMPAs from the Marine Scheme, where relevant, to allow MD-LOT to make an informed decision regarding the potential impacts of the Marine Scheme on NCMPAs.

2.7 European Protected Species Licencing

European Protected Species (EPS) are the animals and plants (species listed under Annex IV of the Habitats Directive) that are afforded protection as part of the Habitats Regulations. If there is the potential for an activity to result in disturbance or injury to an EPS, a licence is required before an activity can be undertaken.

Activities covered by an EPS Licence include those which generate underwater noise disturbance to marine mammal species. EPS Licences are obtained from MD-LOT/NatureScot or government Ministers depending on the nature of the licence application. While the grant of EPS licenses is separate to the marine licence application, it can be considered in parallel by the competent authorities. Should EPS licences be required for pre-installation activities, these will be agreed with the consenting authority during this phase of the Marine Scheme.

2.8 Wider Context

2.8.1 Seabed Lease from Crown Estate Scotland

Crown Estate Scotland (CES) own and manage the majority of the seabed out to 12 NM. CES provide licences granting property rights to lay, maintain and operate cables and pipelines between 0 and 12 NM. CES licence renewable energy generation between 12 and 200 NM offshore. Cables laid to connect offshore wind farms to shore require CES permission for the full length of these cables. Appropriate seabed leases will be sought for the Marine Scheme, in line with requirements informed by and agreed with CES.

[6] *The Scottish Government has conducted consultation on the proposed approach to designating Highly Protected Marine Areas (HPMAs) which will increase the overall level of protection afforded Scotland's seas. Identification of appropriate locations for HPMAs will commence this year with designation targeted for 2026. Where relevant, the Applicant will incorporate information available on HPMAs at the time of EIA into the NCMPA assessment,*

2.8.2 Interactions with Third-Party Assets and Infrastructure

The Marine Scheme will directly interact with a number of third-party assets and infrastructure which will require Crossing and/or Proximity Agreements. Any direct interactions will be subject to prior agreements with asset and infrastructure owners and negotiation of a Crossing and/or Proximity Agreement. The Crossing and/or Proximity Agreement will detail the rights and responsibilities of all parties. Design will address protection of the Marine Scheme and third-party infrastructure.

2.9 Scoping Questions

The Applicant would request responses to the Greenfield scoping questions of relevance to Section 2. Legislative Context and Regulatory Requirements. Please respond to Questions 1 to 3 and Question 5 in Table 1-2.

2.10 Brownfield Scoping Questions

The Applicant would request responses to the Brownfield scoping questions of relevance to Section 2. Legislative Context and Regulatory Requirements. Please respond to Questions 1 to 3 in Table 1-3.

2.11 References

BEIS. 2021a. Planning for New Energy Infrastructure Draft National Policy Statements for energy infrastructure. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015302/nps-consultation-document.pdf

BEIS. 2021b. North Sea Transition Deal. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/972520/north-sea-transition-deal_A_FINAL.pdf

NSTA. 2021. Net Zero: Stewardship Expectation 11. Available online at: https://www.nstauthority.co.uk/media/7184/se11_net-zero.pdf

Scottish Government. 2023a. Scotland's Energy Strategy and Just Transition Plan: Ministerial statement. Available online at: https://www.gov.scot/publications/scotlands-energy-strategy-transition-plan-ministerial-statement/

Scottish Government, 2023b. National Planning Framework 4. Available online at: https://www.gov.scot/publications/national-planning-framework-4/

3 PROJECT DESCRIPTION

The CNSE Project is driven by the need to enable participating Assets to reduce their CO_2 emissions in the most cost efficient way through the provision of electricity from the national grid (lowering the carbon intensity of oil and gas produced from connected Assets). The CNSE Project aims to contribute to the decarbonisation of the offshore energy sector via the electrification of existing oil and gas infrastructure in the central North Sea, assisting the UK Government in meeting net zero and energy security targets.

The CNSE Project is formed of a Marine Scheme and an Onshore Scheme. Throughout the Scoping Report, it is identified where overlap may be associated with the EIA for the Marine and Onshore schemes. This Scoping Report encompasses both the Greenfield and elements of the Brownfield Scopes of the Marine Scheme. The Brownfield Scope elements and associated scoping questions are presented under separate section headings to enable clear scope differentiation.

The CNSE Project is targeting Q1 2027 for the commencement of onshore construction and offshore installation. It is anticipated that the CNSE Project will be ready for first power in December 2028.

3.1 Route Selection and Consideration of Alternatives

As required by the EIA Regulations[7], the EIAR will contain *"a description of the reasonable alternatives studied by the applicant, which are relevant to the works and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the works on the environment"*

The OCS location and routeing of the HVDC and HVAC Cables has sought to optimise the Marine Scheme to achieve the best balance of a range of factors including technical factors, commercial considerations (such as cost and length) and environmental interactions. A key consideration for offshore routeing selection is the start point of the onshore grid connection which the CNSE Project secured via a GB National Electricity Transmission System ('grid') offer in September 2022. The grid offer requires the onshore converter station to tie in within a specified maximum distance of the National Grid substation connection point.

The process of holistic route selection is outlined in Figure 3-1.

[7] *Schedule 3(6) of the Marine Works (EIA) Regulations 2007 (as amended) and Schedule 4(2) of the Marine Works (EIA) (Scotland) Regulations 2017 (as amended)*

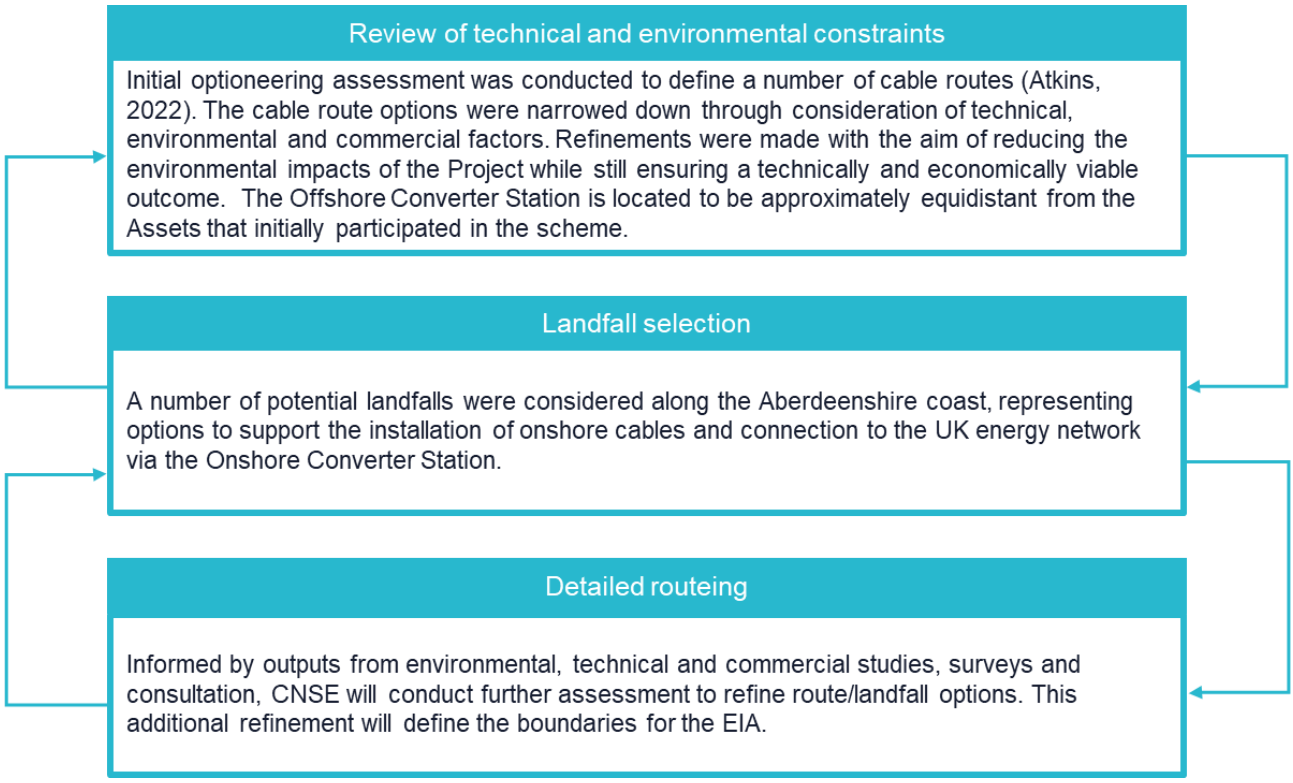

Figure 3-1 Route Selection Process

Key offshore constraints include:

- Technical: seabed substrate, metocean, existing seabed use, existing assets, constructability
- Environmental: protected sites, marine protected areas, offshore cultural heritage, infrastructure (third-party, existing, consented)

As the Marine Scheme develops, and the EIA progresses, cable routeing will be refined following environmental, technical and commercial studies, surveys and consultation. The EIAR will provide a full description of the process. This route will be the subject of the EIA and consent application.

3.2 Landfall Identification and Selection

A preliminary cable landfall study has been conducted to identify the most suitable options for the CNSE Project. Three potential landfalls are being considered (Figure 1-3) one at Sandford Bay and a further two at Longhaven. The potential landfall locations all fall within a suitable distance of the Project grid connection and have been selected following an extensive review of technical engineering, commercial, planning and socio-environmental factors.

As the project develops, and the EIA progresses, a single landfall zone will be selected following further environmental, technical, land-use and commercial studies, surveys and consultation. This will be the subject of the EIA and consent applications.

3.3 Project Design Envelope

The Marine Scheme is in the early stages of development and therefore the Applicant has defined a broad Scoping Boundary and Project Design Envelope (PDE) to retain a necessary degree of flexibly in design until completion of surveys and technical studies which will inform selection of the final cable routeing, landfall location and HVAC Cable-Asset connection.

By following a PDE approach, a maximum design scenario can be defined for key components of the Marine Scheme and potential for significant effects can be established and assessed on a realistic (albeit precautionary) basis. A degree of flexibility will therefore be built into the application by applying a PDE approach, as is common for developments of a similar nature to the Marine Scheme.

At this early stage, the PDE remains indicative and will be refined following the completion of environmental surveys, technical studies and discussions with stakeholders. The key components of the Marine Scheme have been outlined below.

3.4 Pre-Installation Works

3.4.1 Pre-Installation Surveys

Pre-installation surveys may include:

- Confirmatory geophysical and/or benthic surveys, building on the surveys used to inform the EIA and support cable route design;
- Geotechnical surveys to further inform cable and OCS design and installation methods;
- Targeted archaeological surveys; and
- Surveys of Unexploded Ordnance (UXO), or potential UXO (pUXO) involving Remotely Operated Vehicles (ROVs) and/or divers.

Surveys will be carried out using a range of methodologies which may include (but are not limited to) Sub-Bottom Profiler (SBP), Multi-Beam Echo Sounder (MBES), Side-Scan Sonar (SSS), Drop-Down Video (DDV), ROV/diver-based surveys, magnetometer surveys, grab sampling and core sampling. Applications for permits and licences which may be required for these activities will be submitted separately to MD-LOT where required, with supporting information as required.

3.4.2 Pre-Installation Activities

3.4.2.1 Site Preparation

Prior to the installation of the HVDC and HVAC Cables and the OCS, one or more clearance techniques may be required to remove any obstacles. Techniques may include a subsea plough (to be towed across the surface of the seabed), a pre-lay grapnel run (PLGR), use of grab techniques and other comparable methodologies. Boulders will also be removed and, where areas cannot be avoided (e.g., areas of higher boulder density), pre-sweeping may be

required. The method(s) implemented will be selected following consideration of most appropriate techniques to ensure effective site preparation whilst minimising seabed impact.

Where a plough is deployed, displacement or non-displacement methods will clear the installation area of boulders, debris and other obstacles. Where a PLGR is used, a heavy grapnel is used with a series of specially designed hooks along the centreline of the route. Debris is gathered to ensure an adequate installation area is prepared.

3.4.2.2 Pre-Sweep

The requirement for pre-sweep clearance cannot yet be confirmed. If required, due to the presence of areas of sand waves or similar, some limited clearance may be carried out to ensure a level and stable installation area. A Mass-Flow Excavator (MFE) or similar may be used.

Should MFE not achieve the necessary levelling, requiring use of other methods of clearance (i.e. those typically considered as a 'dredging and disposal' activity), relevant sediment sample plan and analysis processes will be adhered to.

3.4.2.3 UXO Clearance

Cable routeing and OCS siting has been informed by a range of environmental, technical and commercial criteria, based on available data. Routeing has sought, where possible, to avoid areas of particularly high UXO risk (i.e., where desktop study indicates a higher likelihood of encountering a UXO). Cable routeing will be further refined to avoid areas of highest UXO risk, and individual potential targets that have been identified via survey outputs / engineering studies.

Some UXO investigation may be required in advance of installation. The disposal of UXO / pUXO is outwith the scope of this assessment as data is yet to be acquired on the exact locations of UXO / pUXO. This approach is considered appropriate and consistent with equivalent UK marine infrastructure projects.

If required, UXO investigation and disposal would be conducted in accordance with prevailing industry guidance and mitigation, including the Joint Nature Conservation Committee (JNCC) guidance (JNCC, 2010). In the event UXO clearance is required, separate applications for permits and licences will be submitted to MD-LOT, and a detailed Marine Mammal Mitigation Protocol (MMMP) (if required) would be developed and agreed with MD-LOT.

3.5 Cables

The HVDC Cables will export energy from the national grid to the OCS where conversion from HVDC to HVAC will occur. From the OCS, HVAC Cables will transfer HVAC to up to four Assets. Table 3-1 presents the project design envelope for the HVDC and HVAC Cables.

Table 3-1 Project design envelope for the HVDC and HVAC Cables

Design Parameters	Project Design Envelope	
	HVDC Cables	HVAC Cables
Number of cables	Up to 2 (bundled)	Up to 5
Total length of cables	Up to 225 km each	Up to 185 km
Installation and protection methods	Cable lay and burial protection: cable plough, jet trencher, mechanical cutting trencher and mass flow excavator.	
Trench width (m)	1	
Width of installation tool (i.e. width of seabed footprint) (m)	25**	
Target burial depth (m)	1.5	
Cable protection material	Concrete mattresses, rock placement, grout bags	
Cable protection width (m)	20	
Cable protection height (m)	3	
Anticipated number of crossings - Pipelines - Cables and Interconnectors	 22 2	 19 5
Crossing material	Concrete mattresses, rock placement, grout bags	
Crossing height, length, width (m)	3 x 500 x 20	

* An HVAC Cable will run from the OCS to each of the four assets. Between the OCS and Judy, two HVAC Cables will be installed. The two cables may be bundled in a single trench or may be laid in 2 trenches, up to 30 m apart

**Maximum width based on use of non-displacement / boulder clearance plough. Tool selection will be refined to minimise width of disturbance

3.5.1 Cable Installation Methods

The cables are expected to be buried along the majority of their routes. Where this is not possible due to seabed conditions or crossings of third-party infrastructure, additional cable protection methods will be required.

The installation of the cables is expected to be achieved through one or more of the following methods, the method(s) implemented being selected on consideration of effectiveness and seabed impact:

- Mass Flow Excavation (MFE): A method of trenching which excavates material without directly interacting with the seabed;
- Jet trenching: Water jets fluidise the seabed, allowing the cable to sink into the seabed under its own weight. This approach is most effective in soft, fine grained sediments (e.g. sands and soft clays);

- Mechanical trencher: Uses chainsaw or wheeled arms with teeth or chisels to cut a defined trench. Trenchers may be suitable for many types of sediments including hard/coarse seabed, although less effective where boulders can damage the teeth; and/or
- Cable ploughs: Consists either of a displacement plough method creating a V-shaped trench into which the cable can be laid; or the non-displacement plough method which brings the cable into the soil. Cable ploughs can used for a range of sediments.

The main options being considered for cable burial are as follows:

- Separate cable lay and burial campaigns (cable is buried by a plough or trencher after placement on the seabed, i.e. post-lay burial;
- Simultaneous cable lay and burial with a plough or trencher; and/or
- Separate trench and burial campaigns (a plough or trencher pre-cuts the trench and the cable laid, followed by backfill by plough, natural backfill or rock placement over the cable).

3.5.2 Cable Protection Methods

Cable routeing is the principal means of avoiding hazards and sensitive features of the seabed. Detailed investigation into seabed conditions along the cable routes allows for selection of preferred installation corridors where burial success is most likely. Where possible, given local seabed conditions, burial is the preferred cable protection method.

In locations of insufficient sediment to cover or bury the cables, and at crossings with third-party infrastructure, additional cable protection may be required. One or more of the following options may be utilised, including:

- Rock placement;
- Concrete mattresses (often used in cable protection and crossing construction over existing cables and pipelines);
- Sand/rock/grout bags (smaller bags filled with sand/rock/grout providing localised protection; and
- Cable physical protection (additional protection from articulated half shells generally made of polyurethane or cast-iron).

The Applicant is committed to keeping rock volumes as low as possible. The use of rock protection will be minimised as far as possible, and only used where required and after consideration of other techniques (i.e. where target burial using installation tools cannot be achieved, at crossings and the proposed landfall location, for example). This will be informed by outputs from the Cable Burial Risk Assessment (CBRA) and Burial Assessment Study (BAS) completed prior to the commencement of installation. MD-LOT direction and guidance will be sought with regards to rock quantities, to ensure volumes are adequate and therefore avoid the need for repeat licensing. Where rock is utilised, it will be clean with low fines. External protection measures will be designed to minimise snagging risk insofar as practicable.

Crossings with third-party infrastructure will be required and proximity / crossing agreements will be sought between the Applicant and each asset owner. Further information relating to the volume, location and type of crossings required along the cable routes will be presented in the EIAR.

3.5.3 HVDC Cable Landfall

A landfall is required to bring the HVDC Cables ashore at Sandford Bay or Longhaven with associated construction work which will occur within the marine environment (below MHWS) and onshore (above MLWS); trenchless technologies, such as Horizontal Directional Drilling (HDD), will be used to install the cable at the landfall. The exact location of the proposed landfall is subject to further refinement as mentioned in Section 3.2, although installation techniques area expected to be common to all potential locations.

At the landfall, a transition joint bay (TJB) will house the interface joint between the HVDC Cables for the Marine Scheme and the underground cables for the Onshore Scheme. The TJB will comprise a concrete, box-like structure which will be used to 'anchor' the cables together. Following connection of the cables within the TJB, the TJB will be backfilled to protect the joint and the area will be reinstated with natural cover (i.e., grass or other). As part of the landfall installation process, a temporary construction compound will be required close to the landfall site as well as some limited temporary access roads.

As detailed above, trenchless technologies, such as HDD, will be used to install the cables at the landfall. This is a trenchless method of drilling which does not require any direct works within the intertidal area. HDD techniques are commonly used at the landfall section of cable routes between MHWS and MLWS, thereby avoiding the intertidal area. HDD installation may be completed through a shore-led (more typically) or marine-led campaign. Shore-led campaigns involve the creation of a drilling compound (above MHWS), drilling of boreholes to accommodate cable ducts, installation of cables within the ducts and supporting activity below MLWS where the cables 'break-out' into the marine environment.

The landfall design and location will lie within the Scoping Boundary (Figure 1-3). Being subject to further detailed assessment, the design and location will be confirmed following further investigation. Elements of the landfall constructed landward of MLWS will be subject to a Planning Application to the Local Planning Authority (Aberdeenshire Council); discussions are ongoing with Aberdeenshire Council and a separate Scoping Opinion will be sought.

Further details of the landfall parameters will be provided within the EIA, as far as practicable given the project stage.

Table 3-2 Project design envelope for the landfall

Design Parameter	Project Design Envelope
Installation method	Trenchless technology, such as HDD
Number of ducts installed	Up to 5 ducts (including contingency for failure)
Number of TJBs	1

3.5.4 Vessel Requirements

The vessels required to complete cable installation works may include:

- Cable lay vessels, including specialist jack-up / shallow-hull barges;
- Pre-lay support vessels;
- Post-lay support vessels, associated with cable protection / rock placement, where required;
- Guard vessels; and
- Support vessels.

During installation activities, a Fisheries Liaison Officer (FLO) will be appointed and appropriate safety zones will be put in place around installation vessels and work areas.

3.6 Offshore Converter Station

An OCS will be required for the Marine Scheme. The OCS will convert HVDC to HVAC power for onward distribution to up to four Assets. The OCS will be located between the four Assets, within a search area of around 1 km x 1 km. This area was selected to minimise the cable corridor lengths to each participating asset (at the time assessment was conducted). A recommendation for the exact location of the OCS within 1 km x 1 km search area will be made following analysis of geophysical and geotechnical survey data. It is anticipated that the OCS will be supported by a piled jacket foundation. Table 3-3 presents the project design envelope for the OCS.

Table 3-3 Project design envelope for the OCS

Design Parameter		Project Design Envelope
Height (m above Mean Sea Level (MSL))		24
Topsides		
Length x width of topside (m)		Up to 84 x 42
Height of topside (m, above MSL)		62
Foundations		
Piled jacket	Base dimensions (m)	Up to 70 x 40
	Number of legs	Up to 6
	Leg diameter (m)	Up to 4
	Number of piles per leg	Up to 3
	Diameter of pile (m)	Up to 3
	Maximum hammer energy (kJ)	Unknown at this stage – to be included in the EIAR
	Additional activity	Contingency drilling if pile refusal

Scour protection may be required for the OCS to mitigate against scour around the foundations. Solutions may include concrete mattresses, rock placement and artificial fronds. The volume and likely locations of scour protection are currently unknown and subject to further analysis. This information will be included in the EIAR.

3.6.1 Offshore Converter Station Installation and Vessel Requirements

The OCS foundation structure (jacket) will be installed first, secondly the topside will be lifted from a transport vessel/barge. The jacket and topside may be transported on the same vessel or separately.

During installation activities a FLO will be appointed and appropriate safety zones will be required to be in place around the OCS. Standard safety zones of 500 m during installation will be sought. Both statutory safety zones and advisory safe passing distances are being considered as part of the development process and the Navigational Risk Assessment (NRA) (see Section 13 Shipping and Navigation). The requirement for statutory safety zones and advisory safe passing distances will be discussed further with consultees during the EIA process.

3.7 Brownfield Scope

Section 1.1 defined the Brownfield Scope as consisting of HVAC Cable installation (including seabed preparation and cable protection), operations and maintenance and decommissioning within the 500 m safety zone of each of four Assets and installation of a BLP at two of the four Assets to provide power conversion infrastructure.

The outline of works included within Section 3.4 Pre-Installation Works and Section 3.5 Cables (excluding Section 3.5.2 HVDC Cable Landfall) may also apply to the Brownfield Scope. There will be specific arrangements established to control and manage pre-installation works and cable and cable protection installation in the respective 500 m safety zones. This will seek to ensure the safe execution of simultaneous operations.

Electrification of each of the four Assets will require modifications to convert the power source from existing fuel gas combustion equipment to grid-supplied electricity. Dependent on the extent of modifications (to be defined during currently ongoing engineering), electrification may require equipment alteration and re-configuration and/or installation of a BLP adjacent to the existing Asset. To incorporate a maximum design scenario, it is assumed that the Brownfield Scope at two of the four Assets includes a BLP. Table 3-4 presents the project design envelope for the BLPs.

Table 3-4 Project design envelope for bridge-linked platform

Design Parameter	Project Design Envelope
Number of BLP	Up to 2
Jacket height (m above LAT)	27
Bridge length	To be included in the EIAR
Topsides	
Length x width of topside (m)	Up to 42 x 34

Design Parameter		Project Design Envelope
Height of topside (m, above LAT)		Up to 52 m
Foundations		
Piled jacket	Base dimensions (m)	Up to 48 x 48
	Number of legs	Up to 4
	Leg diameter (m)	Up to 2
	Number of piles per leg	Up to 3
	Diameter of pile (m)	Up to 2.5
	Maximum hammer energy (kJ)	Unknown at this stage – to be included in the EIAR
	Additional activity	Contingency drilling if pile refusal

Scour protection may be required for the BLPs to mitigate against scour around the foundations. Solutions may include concrete mattresses, rock placement and artificial fronds. The volume and likely locations of scour protection are currently unknown and subject to further analysis. This information will be included in the EIAR.

The BLPs foundation structure (jacket) will be installed first, secondly the topside will be lifted from a transport vessel/barge and finally the bridge will be lifted into place. The jacket, topside and bridge may be transported on the same vessel or separately.

Existing 500 m safety zones established under the Petroleum Act 1998 will be modified to incorporate the BLPs. Advisory safe passing distances will be implemented for all vessels involved in BLP installation.

3.8 Operation and Maintenance

Once in place and buried (where possible), cables do not typically require regular routine maintenance. It is likely that inspection of the cables will be required to monitor condition and burial throughout the life of the Marine Scheme. Any inspections would be undertaken via offshore surveys, including the use of ROVs. Where inspection work concludes that work may be required along any length of the cable route, maintenance would be carried out. This may involve re-positioning of rock protection or placement of additional rock protection, and provision for this will be assessed in the EIA.

The OCS will be the subject of a maintenance programme and an operational Environmental Management System (EMS). The EIA will assess the potential impacts of routine operational and maintenance activities based on experience, and further consents or licences will be applied for if required. Operations and maintenance (O&M) activities may be required at any time during the lifecycle of the Marine Scheme.

3.9 Decommissioning

The Energy Act 2004 and the Scotland Act 2016 require development of a Decommissioning Programme, supported by appropriate financial security, prior to installation. The Decommissioning Programme will follow the guidance found in the Guidance Note for the Decommissioning of Offshore Renewable Energy Installations in Scottish Waters or in the Scottish Part of the Renewable Energy Zone under the Energy Act 2004 (Scottish Government, 2022). Decommissioning activities will comply with all relevant legislation at that time and best practice will be followed when developing a Decommissioning Programme. It is expected that the OCS will be removed in a reverse order of installation.

The lease for cables installed within waters governed by Crown Estate Scotland are generally granted for a set term after which decommissioning is required. For the purpose of the EIA the Applicant assumes that decommissioning will occur 20 years after the commencement of operation. At the end of the project life, an Initial Decommissioning Plan (IDP) will be submitted for approval under the seabed lease from Crown Estate Scotland. Cable recovery may require an environmental and economic impact assessment for years prior and post cable removal to assess the impacts of the decommissioning activities.

The approach to cable decommissioning will be reviewed at the time of decommissioning following the most up to date and best available guidance. Impacts arising during the decommissioning phase of the Marine Scheme are expected to be similar to or less than those anticipated during the installation phase. Any potential impacts would be temporary and would occur over a short period, however there is still the potential for impact to the offshore environment, which will be considered within the EIA.

3.10 Brownfield Scoping Questions

The Applicant would request responses to the Brownfield scoping questions of relevance to Section 3. Project Description. Please respond to Question 4 in Table 1-3.

3.11 References

Scottish Government, 2022. Decommissioning of Offshore Renewable Energy Installations in Scottish waters or in the Scottish part of the Renewable Energy Zone under The Energy Act 2004: Guidance notes for industry (in Scotland). Available online at: https://www.gov.scot/publications/offshore-renewable-energy-decommissioning-guidance-scottish-waters/documents/

4 APPROACH TO SCOPING AND EIA METHODOLOGY

4.1 Scoping Overview

The objective of this Scoping Report is to determine the scope of the EIA which will be completed for the Marine Scheme. It aims to provide the basis for review and feedback from MD-LOT and statutory and non-statutory consultees, inviting them to provide feedback and comment on the proposed approach to the Marine Scheme EIA.

To facilitate informed engagement, this Scoping Report provides information on:

- The Marine Scheme;
- The topics proposed to be scoped in for further assessment as part of the EIAR, where potentially significant impacts may arise as a result of installation, operation and maintenance and decommissioning activities;
- The topics proposed to be scoped out for further assessment as part of the EIAR, where potentially significant impacts are not anticipated when incorporating industry best practice mitigation measures; and
- The proposed approach to understanding baseline conditions and addressing the potential environmental impacts of the Marine Scheme through the EIA process.

This Scoping Report also seeks to define the scope of Cumulative Effects Assessment (CEA) and identify any potential for transboundary impacts. The Applicant welcomes the opportunity for engagement with stakeholders and feedback on the Marine Scheme and scope of the EIAR.

Per Section 1.1, the Brownfield Scope consists of HVAC Cable installation (including seabed preparation and cable protection), operations and maintenance and decommissioning within the 500 m safety zone of each of four Assets, to the point where the cable leaves the seabed. At two of the four Assets, a bridge-linked platform (BLP) may be installed adjacent to the existing production installation to provide power conversion infrastructure. Each chapter of this Scoping Report considers the Brownfield Scope within a separate section.

Respondents to the Scoping Report are requested to separate out comments relating to the Greenfield Scope from those relating to the Brownfield Scope.

4.2 Proposed EIA Methodology

EIA is the process through which the potential impacts of the Marine Scheme on the environment are systematically identified. A detailed understanding is generated of all phases of the Marine Scheme (installation, operations and maintenance and decommissioning) and the environment in which the Scheme is located. The potential impacts of the Marine Scheme are evaluated to assess the significance of the impacts on the environment using a standard EIA methodology (Section 4.2). The methodology considers receptor sensitivity and the likely magnitude of change to baseline conditions that is attributable to the Marine Scheme.

The Marine Scheme has the potential to cause both adverse and positive impacts on the environment and it is through EIA that measures are taken to avoid or reduce the potential for negative impacts. EIA is an ongoing process that considers all phases of a development through installation, operation and maintenance to decommissioning.

4.2.1 Baseline Characterisation

Characterisation of the existing offshore environment will be undertaken to determine the baseline conditions in the area covered by the Marine Scheme, including relevant receptor specific Study Areas for those issues scoped in for further assessment as part of the EIAR. This will require review of the potential evolution of the environmental baseline conditions of the Study Area(s) throughout the lifetime of the Marine Scheme, such that future impacts can be adequately understood.

Baseline characterisation will involve the following steps:

- Study Areas defined for each receptor based on the relevant characteristics of the receptor (i.e., the mobility, range or extent of the receptor);
- Review of available information (both publicly available data and relevant information from site-specific surveys);
- A review of likely potential impacts arising from the Marine Scheme;
- Determine if there is sufficient data available to make an informed EIA judgement with sufficient confidence;
- Identify the requirement for additional data (including an identification of key data gaps) required to answer outstanding questions or uncertainties from the EIA; and
- Review information gathered as part of the EIA to ensure that the environmental baseline is characterised in sufficient detail to allow the Competent Authority to make an informed decision.

4.2.2 Assessment of Potential Impacts

4.2.2.1 Magnitude of Change

The categorisation of magnitude of change will vary depending on the specific pathway, receptor or technical assessment being considered. The broad categorisation for the magnitude of change is as follows:

- High: total change of major alteration to key elements or features of baseline conditions;
- Medium: partial change or alteration to key elements or features of baseline conditions;
- Low: a minor shift away from baseline conditions; and
- Negligible: very slight change to baseline conditions.

For topics where there is the potential for both adverse and positive impacts, magnitude of change definitions will be specifically defined for both positive and adverse impacts.

4.2.2.2 Receptor Sensitivity

The scale of receptor sensitivity to activities associated with the Marine Scheme is dependent on the nature of the receptor in question, but in general can be defined in terms of the quality, value, rarity or importance of the receptor being assessed. The ability of a receptor to adapt to environmental pressures or change and/or to tolerate any potential impacts arising from the Marine Scheme will bey key is assessing the sensitivity of the receptor. The scale of sensitivity is categorised as 'negligible', 'low', 'medium' or 'high', with a more specific scale of increasing sensitivity defined where appropriate. Guidance will also be taken into consideration, with the Applicant calling upon expert judgement when the determination of receptor sensitivity is of particular importance.

Where specific guidance is available for the assessment of impact (e.g. NRA and archaeological impact assessment) these will be followed.

4.2.2.3 Evaluating Significance of Effect

The consideration of significance of effect on a receptor will determine an expression, which may be either quantitative or qualitative and will be informed by expert judgment. Table 4-1 below summarises how impact magnitude and receptor sensitivity are combined to provide significance of effect.

The following terms are used to define significance of effects with Moderate and Major effects defined as 'significant' in EIA terms:

- Negligible: no detectable change to the environment or receptor, resulting in no significant effect;
- Minor: a detectable but non-material change to the environment or receptor, resulting in no significant effect, or small scale temporary changes;
- Moderate: a material but non-fundamental change to the environment or receptor, resulting in a possible significant effect; and
- Major: A fundamental change to the environment or receptor, resulting in a significant effect.

Table 4-1 Significance of Effect

		Sensitivity of Receptor			
		Negligible	Low	Medium	High
Magnitude of Effect	Negligible	Negligible	Negligible	Negligible	Negligible
	Low	Negligible	Negligible	Minor	Minor
	Medium	Negligible	Minor	Moderate	Moderate
	High	Negligible	Minor	Moderate	Major

The EIA will provide topic specific definitions of magnitude, sensitivity and significance as required, incorporating specific guidance and specialist knowledge.

4.2.2.4 Mitigation

For each topic, the EIA process will systematically identify impacts and effects, whilst taking into consideration mitigation measures that are already defined or adopted as embedded mitigation. These mitigation measures will include avoidance, best practice and design commitments, which can be classified into primary or tertiary measures (Table 4-2).

Table 4-2 Approach to mitigation

Term	Definition
Embedded mitigation	Embedded mitigation consists of - Primary mitigation: mitigation embedded into the design of the Marine Scheme and considered as part of the pre-mitigation assessment. - Tertiary mitigation: mitigation implemented with or without the EIA which have a certainty of being implemented and are considered as part of the pre-mitigation assessment. Examples include plans such as Construction Environmental Management Plans (CEMP) and compliance with regulatory requirements.
Additional mitigation	Project-specific mitigation to reduce a potential impact to an acceptable level. These measures are considered additionally to embedded mitigation measures, and typically require additional action post-consent to be implemented. These mitigation measures are only considered in the residual effects assessment (if secondary mitigation is required).

Where the EIA identifies that an aspect of the Marine Scheme is likely to result in significant effects to an environmental receptor, mitigation measures, above and beyond embedded mitigation measures, will be incorporated into the assessment to avoid impacts or reduce them to an acceptable level. The significance of effect will then be reassessed, considering these additional mitigation measures, to determine the residual effect.

4.2.2.5 Monitoring

The EIAR may include monitoring recommendations if significant impacts are identified or where there is uncertainty in the impact assessment.

4.2.3 Cumulative Impact Assessment Approach

Cumulative Impact Assessment (CIA) forms part of the EIA process, i.e. considering potential impacts that could occur cumulatively with other relevant projects or plans that could result in a cumulative effect. The approach to CIA will be refined through ongoing consultation as part of the EIA and will be informed by the MD-LOT guidance for marine energy (Scottish Government, 2018) and relevant aspects of Advice Note 17 (UK Government, 2019) and the Renewable UK Cumulative Impact Assessment guidelines (RUK, 2013). MD-LOT are developing a cumulative effects framework (CEF) tool which will support the assessment of cumulative effects is due to be released in Spring 2023. This tool will be used to inform the EIAR.

This Scoping Report, and subsequent EIAR, will give consideration to plans or projects defined as:

- Under construction;
- Permitted applications(s), but not yet implemented;
- Submitted applications(s) which have not yet received a determination;

- Any plan or project which is considered 'reasonably foreseeable' (i.e., a development for which there is sufficient design information in the public domain).

Based on the nature of a topic-specific assessment and dependent on the individual Zone of Influence (ZoI), the consideration of the potential for cumulative impacts will vary between topics (this is to be expected based on the variation in geographical extent of potential impact and is in accordance with the guidance noted above). All assessments will consider the potential cumulative impacts, in accordance with the EIA Regulations, and the extent of each assessment will be defined within each topic-specific chapter of the EIAR.

The ZoI for each environmental topic considered within this Scoping Report has been used to inform the Study Area for the cumulative and in-combination assessment. On a precautionary basis, a 20 km ZoI has been used as the basis for the initial long list of other developments. This will be reviewed during the CIA conducted as part of the EIA.

Once the relevant receptors and data sources have been identified, the potential pathways linking these receptors and data will be identified. Where no pathway between a source (other than its direct interaction with the Marine Scheme) and a receptor can be identified, the potential for cumulative impacts can be dismissed. Through this process the spatial extent of potential impacts arising from the Marine Scheme can be identified.

Table 4-3 provides an initial long list of projects which may require consideration within the assessment of cumulative impacts. This list will be refined over the course of the EIA Process. There are a number of developments that are in operation which are not considered within Table 4-3, including active and disused/decommissioned projects across all industries. These will be considered within the respective baselines of each topic section.

Table 4-3 Long list of projects which may require consideration within the Cumulative Impacts Assessment

Development name	Development type	Status	Proximity (km)	Details
Campion	Offshore Wind Farm	Pre-consent	Intersects Marine Scheme	Shell New Energies floating offshore wind development. The lease was awarded during Scotwind.
MarramWind	Offshore Wind Farm	Pre-consent	Intersects Marine Scheme	A joint venture between Scottish Power and Shell. A floating offshore wind farm. The lease was awarded during Scotwind.
Muir Mhòr	Offshore Wind Farm	Pre-consent	Intersects Marine Scheme	Vattenfall floating offshore wind development. The lease was awarded during Scotwind.
Teal West	Oil and Gas Development	Pre-consent	8.7	Subsea oil and gas development. Development tied back to the existing Anasuria floating production storage and offloading vessel (FPSO). Environmental Statement submitted in 2022. The operator is Hibiscus Petroleum.

Development name	Development type	Status	Proximity (km)	Details
Eagle	Oil and Gas Development	Pre-consent	1.0	Subsea oil and gas development. Development will be tied back to Kittiwake. The operator is EnQuest.
Jackdaw	Oil and Gas Development	Post-consent	12.9	Oil and gas development which will include presence of a platform. Development will be tied back to Shearwater. Environmental Statement submitted in 2022. The operator is Shell.
Culzean Floating Wind Pilot Project	Oil and Gas Electrification	Pre-consent	11.0	TotalEnergies demonstration project to electrify existing oil and gas asset via a floating wind turbine.
Salamander (INTOG3)	Offshore Wind Farm	Pre-consent	4.1	Simply Blue Group floating offshore wind development. Site awarded as part of the Innovation and Targeted Oil and Gas (INTOG) Licencing Round.
INTOG4	Offshore Wind Farm	Pre-consent	6.0	bp Alternative Energy offshore wind development. Site awarded as part of the INTOG Licencing Round.
GreenVolt (INTOG6)	Offshore Wind Farm	Pre-consent	Intersects Marine Scheme	Floatation Energy offshore wind development. Site awarded as part of the INTOG Licencing Round.
INTOG7	Offshore Wind Farm	Pre-consent	16.6	Cerulean Winds offshore wind development. Site awarded as part of the INTOG Licencing Round.
Cenos (INTOG11)	Offshore Wind Farm	Pre-consent	Intersects Marine Scheme	Floatation Energy floating offshore wind development. Site awarded as part of the INTOG Licencing Round.
INTOG12	Offshore Wind Farm	Pre-consent	10.2	Floatation Energy offshore wind development. Site awarded as part of the INTOG Licencing Round.
INTOG13	Offshore Wind Farm	Pre-consent	4.1	Harbour Energy offshore wind development. Site awarded as part of the INTOG Licencing Round.
Scotland England Green Link 2	Cable	Pre-consent	Intersects HVDC Cables	NationalGrid and Scottish and Southern Electricity Networks (SSEN) project to install HVDC connection.
NorthConnect	Cable	Post-consent	Intersects HVDC Cables	Cable connection between Norway and Scotland.
North Buchan Ness Disposal Site	Dredge and Disposal Site	Open	1.4	-

Development name	Development type	Status	Proximity (km)	Details
Peterhead Harbour Disposal Site	Dredge and Disposal Site	Open	1.0	-

4.2.4 Inter-Related and Transboundary Effects

The EIA will consider the potential for inter-related effects, i.e. the potential effects of multiple impacts arising from the installation, operation and maintenance and decommissioning phase of the Marine Scheme on one specific receptor – both temporally and spatially.

Transboundary impacts arise when impacts resulting from a development within one European Economic Area (EEA) state's territory affect an environmental receptor within another states EEA. The EIA Directive, which has been transposed into Scottish Law through domestic legislation prior to the UK's exit from the European Union, requires that transboundary impacts are assessed as part of a developments EIA. This Scoping Report will identify relevant transboundary impacts which will be considered further as part of the EIAR or, where necessary, will state if no transboundary impacts are anticipated.

4.2.5 Proportionate Approach to EIA

This Scoping Report forms a key step in ensuring a proportionate approach to EIA. The importance of proportionate and accessible EIAs is recognised by regulators, stakeholders and practitioners (e.g. IEMA, 2017). The aim of ensuring a proportionate approach to EIA considers the following:

- A robust EIA Scoping process based on industry experience of the likely key environmental impacts; and
- Consideration of embedded and industry best practice mitigation measures. A number of mitigation measures have been built into the Marine Scheme and are therefore considered within the relevant receptor chapters as part of this Scoping Report.

4.2.6 Scoping Report Exclusions

Based on the nature of the Marine Scheme, and in line with the Applicant's commitment to producing an EIA that is robust and proportionate to the nature of the Marine Scheme, some topics have been scoped out for further assessment as part of the EIA. This approach is consistent with industry best practice guidance encouraging a streamlined and focused EIA (including IEMA, 2017). Table 4-4 below provides a summary of the Marine Scheme Scoping Report exclusions and the rationale for this approach.

4.3 Scoping Questions

The Applicant would request responses to the Greenfield scoping questions of relevance to Section 4. Approach to Scoping and EIA Methodology. Please respond to Questions 4, 6 and 15 in Table 1-2e.

4.4 Brownfield Scoping Questions

The Applicant would request responses to the Brownfield scoping questions of relevance to Section 4. Approach to Scoping and EIA Methodology. Please respond to Questions 1 and 4 in Table 1-3.

Table 4-4 Rationale for exclusion of specific topics from further assessment

Topic	Rationale
Aviation, Military and Radar	The cable infrastructure associated with the Marine Scheme lies on the seabed with no potential for significant impacts to offshore aviation, military and radar activity during the installation, operation and maintenance and decommissioning phases. The OCS and up to two BLPs are located >200 km offshore in an area with existing permanent offshore infrastructure (namely multiple oil and gas assets). The introduction of a single OCS and up to two BLPs which will be painted, marked and lit in conformance with aviation and marine navigation requirements will not cause potential for significant impacts to offshore aviation, military and radar activity during the installation, operation and maintenance and decommissioning phases. Aviation lighting and marking will abide by the requirements set out in • CAA – The Air Navigation Order (CAA, 2016 (a)) and CAP 393 (CAA, 2021 (b)); • CAA CAP 437 – Standards for Offshore Helicopter Landing Areas (CAA, 2021 (a)); and • MOD Obstruction Lighting Guidance (MOD, 2020). Individual operators of the Assets at which a BLP may be installed will conduct assessment to maintain conformance with the above requirements. As there is no potential for significant impact, a detailed assessment of this topic will not be considered as part of this Scoping Report, and Aviation, Military and Radar is proposed to be scoped out of the EIA.
Seascape, Landscape and Visual Impact Assessment (SLVIA)	Once installed, the cable infrastructure associated with the Marine Scheme will be entirely subsea with no infrastructure above the surface of the sea and will be undetectable from an SLVIA perspective. The installation of the cable (particularly in relation to the works associated with the landfall location), will be associated with some temporary visual impacts primarily relating to the physical presence of Marine Scheme vessels. Cable installation works are localised and short-term and will not have a potential for significant SLVIA impacts. The OCS is located >200 km offshore and any works associated with the installation, operation and maintenance and decommissioning phase will be undetectable from the vast majority of SLVIA receptors, save for passing vessels who may temporarily see the OCS on passage. As there is no potential for significant impact, a detailed assessment of this topic will not be considered as part of this Scoping Report, and SLVIA is proposed to be scoped out of the EIA.
Major Accidents and Disasters	Works associated with the installation, operation and maintenance and decommissioning phases of the Marine Scheme are not anticipated to include activities that will give rise to major accidents or foreseeably increase the potential for disaster. The investigation (and potential disposal) of UXO/pUXO is not included in the Marine Scheme and EIA (Section 3.4.2.3). Crossings with third-party infrastructure will be required for the Marine Scheme. These crossings will be managed in line with legislation, guidance and industry best-practice (Section 2.8.2) and via crossing/proximity agreements. No infrastructure crossing required for the Marine Scheme is considered to be at risk of leading to a major accident or disaster. In advance of installation, the Applicant will produce a CEMP incorporating site waste management and chemical risk (of which limited inventory will exist). There is no potential for major accidents and disasters as a result of the Marine Scheme. A detailed assessment of this topic will not be considered as part of this Scoping Report and it is proposed that major accidents and disasters are scoped out of the EIA.
Human Health	There will be no discernible impacts to human health as a result of works associated with installation or decommissioning of the Marine Scheme, nor are there any long-term impacts on human health resulting from operation and maintenance activity. Section 15 Other Sea Users considers the assessment of potential impact of the Marine Scheme on human receptors. There is no potential for significant impact as a result of the Marine Scheme. A detailed assessment of human health will not be considered as part of this Scoping Report, and it is proposed that human health is scoped out of the EIA.
Socio-economics	The potential impacts of the Marine Scheme on socio-economics during the installation and decommissioning phases are anticipated to be limited to the a small number of installation vessels and a relatively small number of supporting specialist personnel. During the operation and maintenance phase, the potential for impacts to socio-economics are low and associated solely with very localised and infrequent remedial or maintenance works. The CNSE Project will consider how contribution may be made to the local community and economy. The assessment will be proportionate to the potential impacts associated with the Marine Scheme and therefore a detailed, dedicated assessment will not be undertaken within a standalone chapter. Any potential, temporary impacts of the Marine Scheme on recreation and tourism activities are addressed separately in Section 15 Other Sea Users. Any potential impacts to commercial fisheries have been considered within Section 12 Commercial Fisheries. There is no potential for significant impact as a result of the Marine Scheme. A detailed assessment of socio-economics will not be considered as part of this Scoping Report and it is proposed that socio-economics be scoped out of the EIA.

Topic	Rationale
Climate Change	The assessment of climate change incorporates a number of elements, including: Carbon Assessment This specific consideration relates to the potential impacts of the Marine Scheme on carbon emissions, including how this may impede the ability of the Scottish Government to meet their climate targets. The nature of the Marine Scheme means that installation works will involve limited vessel numbers. Construction material associated with the Marine Scheme is relatively limited and primarily associated with the cables, any additional protection material and the OCS. Transportation of materials associated with the Marine Scheme will be coordinated and will not involve repeated journeys to and from the shore. The carbon impact associated with the Marine Scheme will not have the potential to impact the Scottish Government's ability to meet net zero targets. Further, the Marine Scheme will contribute to GHG reduction, replacing power generated by gas and/or diesel turbines on the Assets with less carbon intensive electricity from the national grid. Climate Change Risk Review The nature, and location of the Marine Scheme means that it is not considered to be vulnerable to the impacts of climate change. The HVDC and HVAC Cables will be trenched where possible with additional protection being utilised, where required, thereby reducing any potential risks arising from climate change. In-Combination Climate Change Impact (ICCI) Consideration has been given to the ways in which projected climate change will alter the significance of the Marine Scheme on the receiving environment (in accordance with Institute of Environmental Management and Assessment (IEMA) guidance (IEMA, 2020)). No changes have been identified in the future baseline which would result in ICCI. There is no potential for significant (adverse) impact. For these reasons, a dedicated assessment regarding the potential impact of the Marine Scheme on climate change (and climate change on the Marine Scheme) is not proposed as part of this Scoping Report and climate change is proposed to be scoped out of the EIA.

4.5 References

IEMA, 2017. Delivering Proportionate EIA. Available online at: https://www.iema.net/resources/reading-room/2017/07/18/delivering-proportionate-eia

IEMA, 2020. Environmental Impact Assessment Guide to: Climate Change Resilience & Adaptation. Available online at: https://www.iema.net/downloading-document/42159

Scottish Government, 2018. Marine Scotland Consenting and Licensing Guidance For Offshore Wind, Wave and Tidal Energy Applications. Available online at: https://www.gov.scot/binaries/content/documents/govscot/publications/consultation-paper/2018/10/marine-scotland-consenting-licensing-manual-offshore-wind-wave-tidal-energy-applications/documents/00542001-pdf/00542001-pdf/govscot%3Adocument

UK Government, 2019. Advice Note Seventeen: Cumulative effects assessment relevant to nationally significant infrastructure projects. Available online at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-17/

5 STAKEHOLDER CONSULTATION

5.1 Regulatory, Statutory and non-Statutory Consultation

Early consultation that continues throughout the project lifecycle allows integration of public and stakeholder concerns, opinions and data into project decision-making and design processes. Consultation also provides the opportunity for the applicant to communicate project progress. Throughout the lifecycle of the Marine Scheme, consultation will be conducted with organisations, communities and individuals that have an interest in the development of the Marine Scheme.

Consultation with stakeholders during the EIA process is expected to be focused on the following key stages:

- Consultation with regulators and other stakeholders in relation to licences and permits associated with pre-installation surveys (e.g. geophysical, benthic). This has already commenced;
- Formal submission and publication of this Scoping Report and request for Scoping Opinions;
- Follow-up to scoping, to confirm the EIA approach with key stakeholders and to refine the scope of EIA studies being undertaken, based on the EIA Scoping Opinions received;
- Provision of key technical reports and data, used to inform the assessments, to relevant stakeholders for information and feedback throughout the EIA;
- Completion of statutory pre-application consultation (PAC);
- Formal submission and publication of consent applications and the accompanying EIAR to seek views on the proposal; and
- Additional public / stakeholder-specific engagement events that may take place at intervals during the consenting process.

As part of the formal request for a Scoping Opinion, it is anticipated that MD-LOT will carry out consultation with a range of statutory and non-statutory consultees, pursuant to Part 4, Regulation 14 of the Marine Works EIA (Scotland) Regulations 2017 and Schedule 4, Part 6 of the Marine Works EIA Regulations 2007. The Applicant will have due regard for these consultation responses and any technical feedback received will inform the EIA. The Applicant will provide a summary of how consultation responses have been considered as part of the EIAR prepared for the Marine Scheme.

As the EIA progresses, technical engagement will be carried out with a range of relevant stakeholders in relation to the Marine Scheme; this is anticipated to include, but is not limited to, bodies such as:

- Crown Estate Scotland (CES);
- Historic Environment Scotland (HES);
- Joint Nature Conservation Committee (JNCC);
- Maritime and Coastguard Agency (MCA);
- Ministry of Defence (MoD);
- MD-LOT;
- NatureScot;
- Northern Lighthouse Board (NLB);
- Royal Society for the Protection of Birds (RSPB);
- Royal Yacht Association (RYA) Scotland;
- Scottish Environmental Protection Agency (SEPA);
- Scottish Fishermen's Association (SFF);

- Scottish White Fish Producers Association (SWFPA);
- Scottish Wildlife Trust;
- UK Chamber of Shipping; and
- Whale and Dolphin Conservation.

5.1.1 Consultation to Date

Regulatory consultation since early 2022 with MD-LOT, OPRED, NSTA and the Health and Safety Executive (HSE) has involved discussion of

- Consenting strategy for electrification projects and cross regulatory body engagement to determine best approach for special cases;
- Engagement with NSTA on expectations and value levers for electrification;
- Treatment of Greenfield and Brownfield Scope for EIA;
- Advice on industry requirements and norms;
- Permit and consent requirements triggers for variations in brownfield modification concepts; and
- Decommissioning philosophy of the CNSE Project.

A summary of the current understanding of the permitting requirements for the Brownfield Scope, as discussed with the relevant regulators is presented in Table 5-1[8].

Table 5-1 Brownfield Scope permitting requirements summary table

Activity	Requirement	Regulator
Cable lay within 500 m zone	Marine Licence	MD-LOT
	Cable lay notification	tbc – seeing Scoping Question
Cable/platform interface (subsea plug in point)	Pipeline Works Authorisation (if required)	NSTA
Topsides transformer equipment on existing facilities/BLP installation*	Field Development Plan Addendum Field flare/vent consent update	NSTA
	Safety Case material change Design Notification (tbc)	HSE
	BLP installation – Environmental Screening to confirm no EIA is required	tbc – seeing Scoping Question
	Variation to platform permits - Pollution Prevention and Control - Emissions Trading Scheme - Oil Pollution Prevention and Control - Consent to Locate	OPRED

[8] *Greenfield permitting requirements are addressed within Table 2-1*

The EIA/ML requirements for the BLPs are subject to ongoing regulatory discussion and questions are raised within this Scoping Report.

5.2 Community and Public Consultation

Consultation with local communities is a key part of the consenting processes. Public exhibitions will be held to introduce and update on the progress of the Marine Scheme. The events will also allow provision of responses to any queries and questions the public may have. Pre-application consultation (Section 2.2) will be one of the main opportunities for communities and members of the public to: review the plans; provide comments; submit feedback; and to shape Marine Scheme design prior to submission of regulatory applications. The Applicant will ensure that communities and wider public stakeholders who are most affected by the proposals are engaged in the development of the Marine (and Onshore) Schemes and have the opportunity to comment on the proposals at key decision making points.

5.3 Scoping Questions

The Applicant would request responses to the Greenfield scoping questions of relevance to Section 5. Stakeholder Consultation. Please respond to Question 3 in Table 1-2.

6 PHYSICAL ENVIRONMENT

6.1 Introduction

This section provides an overview of the physical environment sensitives in relation to the Marine Scheme. This section considers sensitivities associated the hydrodynamic, waves, sediment, geological, bathymetry and geomorphological receptors during the installation, operation and maintenance and decommissioning phase of the Marine Scheme.

In most cases the marine physical environment itself is not a direct receptor of potential impacts from marine development activities and instead acts as a pathway for impacts on other marine receptors. Therefore, this section of the Scoping Report should be read in conjunction with the following sections:

- Section 7 Water and Sediment Quality;
- Section 8 Benthic Ecology;
- Section 9 Fish and Shellfish Ecology;
- Section 10 Ornithology;
- Section 11 Marine Mammals;
- Section 12 Commercial Fisheries;
- Section 13 Shipping and Navigation;
- Section 14 Marine Archaeology; and
- Section 15 Other Sea Users.

6.2 Legislation, Policy and Guidance

In addition to the relevant policy and legislation described in Section 2, the following section outlines the legislation, policy and guidance that will be taken into consideration in relation to the physical environment EIA.

No specific legislative controls exist in Scotland which can be applied to the assessment of the offshore physical environment.

6.2.1 Guidance

- Advice to Inform Development of Guidance on Marine, Coastal and Estuarine Physical Processes Numerical Modelling Assessments. Report No 208. (NRW, 2017);
- Guidance Note. Marine Physical Processes Guidance to inform Environmental Impact Assessment (EIA). GN041. (NRW, 2020);
- Environmental Impact Assessment Handbook: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment process in Scotland (SNH, 2018);
- Offshore wind farms: guidance note for Environmental Impact Assessment in respect of Food and Environmental Protection Act (FEPA) and Coastal Protection Act (CPA) requirements: Version 2 (Cefas, 2004);
- Carbon Trust (CBRA) Guidelines (Carbon Trust, 2015);
- Review of Cabling Techniques and Environmental Effects Applicable to the Offshore Wind Farm Industry (BERR, 2008);
- Marine Renewable Energy and the Natural Heritage: An Overview and Policy Statement' (SNH, 2003); and
- Marine Scotland Licensing and Consents Manual covering marine renewables and offshore wind energy development. Report commissioned for Marine Scotland (ABPmer, 2012).

6.3 Study Area

The physical environment Study Area varies across the Marine Scheme, with a 10 km buffer applied to the Marine Scheme from MHWS to 65 km offshore and a 5 km buffer applied from 65 km offshore to the OCS and Assets (Figure 6-1). These buffers have been defined by tidal ellipses. Closer to the coast, the tidal ellipse has a length of approximately 10 km. Further offshore, the ellipse is shorter and so the buffer has been adjusted to account for this. The physical environment Study Area (i.e. the tidal ellipse) gives consideration to:

- The distance which suspended sediment plumes may be advected (and meaningfully interact with any potentially sensitive receptors); and
- The distance from the Marine Scheme that tide and wave blockage impacts may potentially be detected, informed by expert judgement and considering prevailing direction across the Marine Scheme.

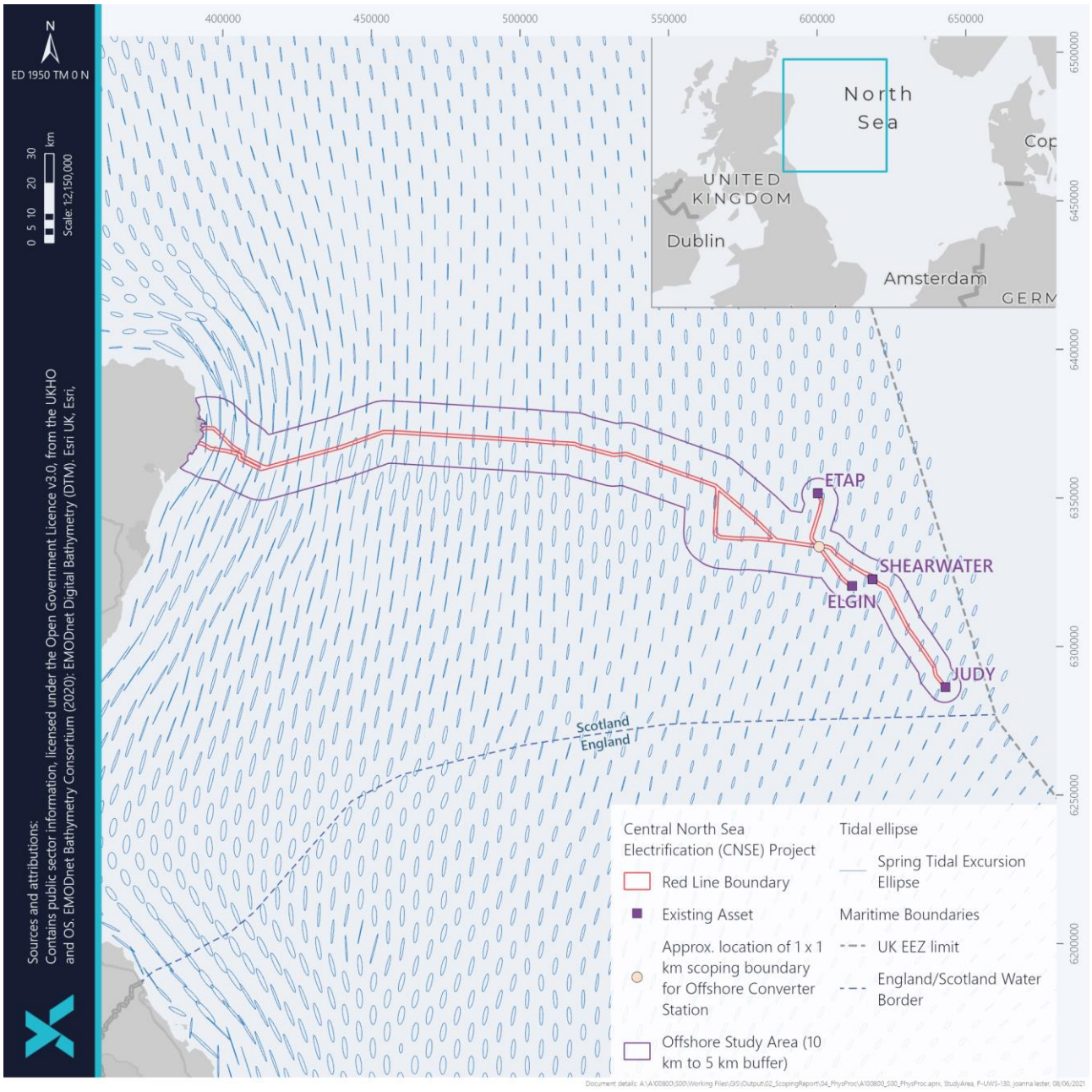

Figure 6-1 Physical environment Study Area

6.4 Key Data Sources

The publicly available datasets and resources that are considered relevant to the assessment of potential impacts to the physical environment have been summarised in Table 6-1 below.

Table 6-1 Data sources for the physical environment assessment

Name of Source	Description / Link	Author	Date
General Information			
Sectoral Marine Plan: Regional Local Guidance	https://www.gov.scot/publications/sectoral-marine-plan-regional-locational-guidance/documents/	Scottish Government	2020
Coasts and seas of the United Kingdom, Region 3 North-east Scotland: Cape Wrath to St. Cyrus	https://data.jncc.gov.uk/data/6473ed35-d1cb-428e-ad69-eb81d6c52045/pubs-csuk-region-03.pdf	JNCC	1996
Coastal Cells in Scotland: Cell2 – Fife Ness to Cairnbulg Point	https://www.dynamiccoast.com/files/Ramsay_Brampton_Cell_02.pdf	HR Wallingford	2000
Marine Scotland – National Marine Plan Interactive	https://marinescotland.atkinsgeospatial.com/nmpi/	Marine Scotland	2023
Bathymetry, Geology and Seabed Sediment			
United Kingdom Hydrographic Office (UKHO) Admiralty Chart data & UKHO INSPIRE bathymetric data	https://datahub.admiralty.co.uk/portal/apps/webappviewer/index.html	UKHO	2017
British Geological Survey Offshore GeoIndex Map	http://mapapps2.bgs.ac.uk/geoindex_offshore/home.html	BGS	2020
Strategic Environmental Assessment Data Portal	https://webapps.bgs.ac.uk/data/sea/app/search	BGS	2019
Marine Scotland Data Portal	https://marine.gov.scot/data/marine-scotland-data-portal	Marine Scotland	2022
Hydrodynamics and Waves			
National Tidal and Sea Level Facility-Observational Water Level Records	https://www.ntslf.org/	NTSLF	2022
Scottish Shelf Waters and Reanalysis Service	https://marine.gov.scot/information/scottish-shelf-waters-reanalysis-service	Marine Scotland	2020
Atlantic – European North West Shelf – Ocean Physics Analysis and Forecast	https://data.marine.copernicus.eu/product/NORTHWESTSHELF_ANALYSIS_FORECAST_PHY_004_013/description	Copernicus	2021
Atlantic – European North West Shelf – Ocean Physics Reanalysis	https://data.marine.copernicus.eu/login?redirect=%2Fproduct%2FNWSHELF_MULTIYEAR_PHY_004_009%2Fdownload%3Fdataset%3Dcmems_mod_nws_phy-bottomt_my_7km-2D_P1M-m	Copernicus	2019
UK Offshore Energy Strategic Environmental Assessment 3 (OESEA3).	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachm	DECC	2016

Name of Source	Description / Link	Author	Date
Appendix 1D – Water Environment (Regional Sea 6 &7)	ent_data/file/504541/OESEA3_A1d_Water_environment.pdf		
Admiralty Total Tide tidal prediction software	UK Hydrodynamic Office (UKHO) Admiralty Maritime Data Solutions	UKHO	2020
Atlas of UK Marine Renewable Energy, Interactive Map	https://www.renewables-atlas.info/explore-the-atlas/	ABPmer	2017
SEASTATES Metocean Data and Statistics Interactive Map	https://www.seastates.net/explore-data/	ABPmer	2018
Cefas WaveNet	https://wavenet.cefas.co.uk/map	Cefas	2022
British Oceanographic Data Centre (BODC)	https://www.bodc.ac.uk/data/	BODC	2022
UK Climate Projections (UKCP) 18	https://www.metoffice.gov.uk/research/approach/collaboration/ukcp	Met Office	2022
Water Column Properties			
Cefas Suspended Sediment Climatologies around the UK	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/584621/CEFAS_2016_Suspended_Sediment_Climatologies_around_the_UK.pdf	Cefas	2016
Atlantic – European North West Shelf – Ocean Physics Analysis and Forecast	https://data.marine.copernicus.eu/product/NORTHWESTSHELF_ANALYSIS_FORECAST_PHY_004_013/description	Copernicus	2021
Atlantic – European North West Shelf – Ocean Physics Reanalysis	https://data.marine.copernicus.eu/login?redirect=%2Fproduct%2FNWSHELF_MULTIYEAR_PHY_004_009%2Fdownload%3Fdataset%3Dcmems_mod_nws_phy-bottomt_my_7km-2D_P1M-m	Copernicus	2019
Frequent locations of oceanic fronts as an indicator of pelagic diversity: Application to marine protected areas and renewables	https://www.sciencedirect.com/science/article/abs/pii/S0308597X13002066	Miller and Christodoulou	2014
Increased mixing and turbulence in the wake of offshore wind farm foundations	https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2019JC015858	Schultze *et al.*,	2020
Potential Impacts of Offshore Wind Farms on North Sea Stratification	https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0160830	Carpenter *et al.*,	2016
Unstructured grid modelling of offshore wind farm impacts on seasonally stratified shelf seas	https://www.sciencedirect.com/science/article/pii/S0079661115300379	Cazenave *et al.*,	2016
Climatology of Surface and Near-bed Temperature and Salinity on the North-	https://data.marine.gov.scot/sites/default/files//berx-hughes_2009.pdf	Berx, B., Hughes, S	2009

Name of Source	Description / Link	Author	Date
West European Continental Shelf for 1971–2000 (2009).			
British Oceanographic Data Centre (BODC) Observational Conductivity Temperature Depth (CTD) Records	https://www.bodc.ac.uk/	BODC	2019
Anthropogenic Mixing in Seasonally Stratified Shelf Seas by Offshore Wind Farm Infrastructure	https://doi.org/10.3389/fmars.2022.830927	Dorrell *et al.*,	2022
Emergence of Large-Scale Hydrodynamic Structures Due to Atmospheric Offshore Wind Farm Wakes	https://doi.org/10.3389/fmars.2022.818501	Christiansen *et al.*	2022
Stratified and nonstratified areas in the North Sea: Long-term variability and biological and policy implications	https://doi.org/10.1002/2014JC010485	Van Leeuwen *et al.*	2015
Coastal Characteristics			
Scottish Government Dynamic Coast: Scotland's National Coastal Change Assessment Map	https://www.dynamiccoast.com/webmaps	SNH	2017
Dynamic Coast 2	https://snh.maps.arcgis.com/apps/webappviewer/index.html	Dynamic Coast	2020
EMODnet Coastal Type and Coastal migration EMODnet Geology Mapper.	https://emodnet.ec.europa.eu/geoviewer/	EMODnet	2021
Scottish Coastal Observatory	https://marine.gov.scot/data/scottish-coastal-observatory-data	Marine Scotland & Scottish Government	2019
Scottish Environment Protection Agency (SEPA) flood risk maps	https://www.sepa.org.uk/environment/water/flooding/flood-maps/	SEPA	2022
Scottish remote sensing portal	https://remotesensingdata.gov.scot/	Scottish Government	2022
Greenfield CNSE Habitat Assessment Report	Report Ref: 11823.E04	Gardline	2023
Greenfield CNSE Environmental Baseline Survey Report	Report Ref: 11823.E03	Gardline	2023

Additional geophysical and environmental subtidal surveys are being undertaken (Section 8.4) to inform the EIA, together with the baseline data sources identified above.

6.5 Baseline Environment

This section of the Scoping Report characterises the physical environment baseline conditions through an initial desk-based analysis of the publicly available data and information sources presented in Table 6-1.

6.5.1 Geology and Seabed Sediment

6.5.1.1 Bedrock Geology

The basic structural framework bedrock geology throughout the North Sea is a result of Upper Jurassic/ Lower Cretaceous rifting, with partial control from older structural elements (Norwegian Petroleum Directorate, 2021). The dominant bedrock geology across the physical environment Study Area is rock, siliciclastic, argillaceous and sandstone of Eocene to Pliocene age (tertiary interbedded), which extends from 30 km offshore to the boundary of the Scottish Economic Exclusion Zone (EEZ) (at approximately 230 km) and occurring at depths of >50 m (BGS, 2023; Marine Scotland, 2023).

6.5.1.2 Quaternary Geology

The quaternary geology of the physical environment Study Area is diverse, with lithologies including sand and gravel; soft mud; firm to hard interbedded sand, silts and clays and soft interbedded; and undifferentiated mixed of the same lithology (BGS, 2023) occurring at depths of up to 50 m. The sand and gravel lithologies which characterise the nearshore environment extend approximately 15 km offshore, with the soft mud lithologies characterising the physical environment between 15 km and approximately 90 km (interspersed with large deposits of firm to hard interbedded sediment). Between approximately 90 km and the boundary of the Scottish EEZ, quaternary geology is a mixture of both firm to hard interbedded sediment and undifferentiated deposits.

The thickness of quaternary deposits across the physical environment Study Area varies along the length of the Marine Scheme, with sediments of 5 – 20 m thick defining the physical environment Study Area between landfall and approximately 18 km offshore. Between approximately 18 – 34 km offshore quaternary deposit thickness ranges from 20 – 50 m. From approximately 35 km offshore to the boundary of the Scottish EEZ (encompassing the OCS and Assets), quaternary geology thickness is >50 m.

6.5.1.3 Seabed Sediment

The physical environment Study Area is defined by three different sediment types: sand, gravel, and gravelly sand (Figure 6-2). The Marine Scheme is dominated by sand, with the HVDC Cables passing through a region of gravelly sand and slightly gravelly sand between approximately 25 – 70 km offshore. The seabed sediment at the OCS and HVAC Cables to the Assets is predominantly muddy sand, with the ETAP and Judy Assets located in areas of sand (BGS, 2023).

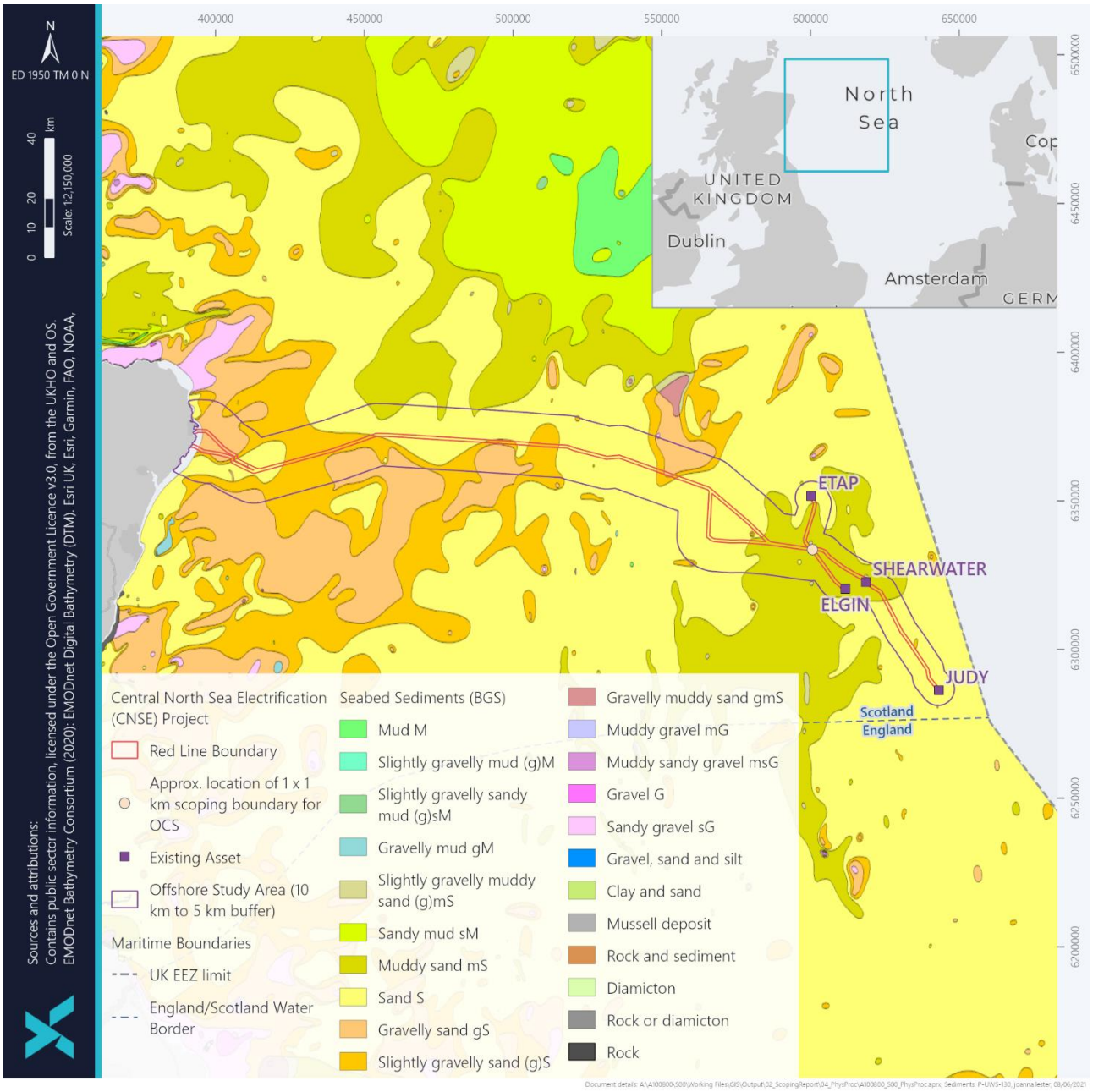

Figure 6-2 Sediments within the physical environment Study Area

6.5.2 Bathymetry and Morphology

Water depths across the CNS gradually deepen from approximately 40 m at Dogger Bank (located approximately 215 km to the south of the OCS) to approximately 100 m at the Fladen/Witch Ground (located approximately 180 km to the north of the OCS) (DTI, 2001; DECC, 2016). Across the physical environment Study Area water depths range from 0 m below Lowest Astronomical Tide (LAT) at the HVDC landfall locations out to a maximum depth of approximately 100 m below LAT (Marine Scotland, 2023, EMODnet, 2023) at the OCS and Assets.

The degree of slope varies across the physical environment Study Area, with the greatest variation in slope occurring between 0 km and approximately 40 km offshore (with a slope of between 0 and 17 degrees). The largest degree of slope across the physical environment Study Area is associated with the cable landfall locations. From approximately 65 km offshore to the Scottish EEZ boundary (encompassing the OCS and the Assets) the seabed is relatively flat and even and the degree of slope is <1°.

6.5.3 Hydrodynamic Regime

The anti-clockwise nature of water movement throughout the North Sea originates from the influx of Atlantic water, via the Fair Isle Channel and around the north of Shetland. The main outflow of water is northwards towards the Norwegian coast (DECC, 2016). The direction of water movement throughout the CNS is generally in a southwards direction (Ramsay & Brampton, 2000; DTI, 2001; DECC, 2016). In this part of the CNS, the mean spring range decreases in an offshore direction. The physical environment Study Area has a mean spring tidal range of approximately 3.15 m in the nearshore environment decreasing to approximately 1.65 m in the waters associated with the OCS and Assets (ABPmer, 2018). Mean neap tidal range is approximately 1.57 m in the nearshore environment and approximately 0.72 m in the waters associated with the OCS and Assets (ABPmer, 2018).

There is variation in the mean spring peak currents across the physical environment Study Area, with mean spring tidal flow speeds also decreasing in an offshore direction. Mean spring peak flows range from between 1.51-2 m/s in the nearshore environment to between 0.26-0.5 m/s in the waters associated with the OCS and Assets. Nearshore mean neap peak flows are approximately 0.53 m/s, with flow speeds of around 0.24 m/s in the waters associated with the OCS and Assets (ABPmer, 2018).

6.5.4 Waves

The mean annual wave heights across the physical environment Study Area increases in an offshore direction, ranging from approximately 1.48 m in the nearshore environment at the proposed landfalls to approximately 2.07 m in the waters around the OCS and Assets (ABPmer, 2018). Across the physical environment Study Area the mean significant wave height ranges from 0.51-1 m between the Marine Scheme landfall locations and approximately 4.5 km offshore. Between approximately 4.6 km and approximately 143 km offshore mean significant wave height ranges from 1.01-1.75 m. The mean significant wave height in the waters associated with the OCS and three of the Assets (ETAP, Elgin and Shearwater) is 1.76-2 m. The mean significant wave height at the fourth Asset (Judy) is 1.51-1.75 m.

Representative mean annual and seasonal wave properties obtained from ABPmer (2018) indicated that annual mean significant wave height across the northern coast of Scotland typically ranges between 1.75 – 2 m throughout the

year (Marine Scotland, 2016; ABPmer, 2018). In the summer months, the mean wave height ranges between 1.08 m and 1.42 m, while in winter the mean wave height ranges between 1.93 m and 2.79 m (ABPmer, 2018). The dominant wave direction at the landfall locations is towards the southeast, with between 25-30% of waves at these locations travelling in this direction. The most common significant wave height at the landfall locations is between 0.5 and 1 m. At the approximate location of the OCS, the dominant wave direction has shifted to the north, with over 30% of waves at this location travelling in this direction. However, the most common significant wave height at the approximate location of the OCS is again 0.5 and 1 m, occurring just under 10% of the time.

As part of the Cefas WaveNet network of buoys throughout the UKCS, the 'ETAP' buoy (commissioned in 2012) is located within the physical environment Study Area. The buoy collects information relating to wave conditions in 94 m water depth (Cefas, 2023). Since 2012, the records show wave heights ranging from <1 m to 10 m. In 2022, wave heights were generally <4 m, with the exception of the winter months where stormier weather resulted in a maximum wave height of approximately 9 m (Cefas, 2023).

6.5.5 Sediment Transport Regime

Sediment transport is described in the context of coastal cells and sub-cells which are defined by common patterns in local coastal processes. The Marine Scheme is located wholly within the CNS regional seas Cell 2 (Cairnbulg Point to Fife Ness) (Ramsay & Brampton, 2000) Subcell 2d (Girdle Ness to Cairnbulg Point) (Fitton *et al.*, 2017).

Sediment movement throughout the physical environment Study Area is not solely influenced by prevailing hydrographic processes (such as swell, waves and winds, tides and currents) but also by the physical characteristics of the surrounding environment (including the bathymetry and seabed sediment type). The sediment transport regime throughout Subcell 2d is characterised by northward moving sediment, influenced by changing coastal characteristics (including dune erosion and open stretches of coastlines dominated by longshore drift) (Fitton *et al.*, 2017). Existing research by Ramsay & Brampton (2000) defines a predominantly south to north movement of sediment along the Aberdeenshire coast. Sediment movement throughout the physical environment Study Area will be assessed in more detail within the EIAR. The suspended sediment concentrations (SSC) throughout the physical environment Study Area ($1x10^{-3}$ kg/m) range from 0.08-1, with SSC in the waters associated with the OCS ranging from 0.08-0.6 and 0.8-1 at the Marine Scheme landfall locations (Cefas, 2016).

6.5.6 Fronts and Stratification

The mean annual surface temperature across the majority of the physical environment Study Area (wholly encompassing the Marine Scheme) is approximately 9.5° C, with mean annual surface temperatures at the Judy asset approximately 9.7° C (NMPi, 2023). There are no known fronts across the CNS region. The potential for stratification has been assessed on the basis of work completed by Miller and Christodoulou (2014), which provides a seasonally averaged front frequency map for summer months based on an interpretation of ten years of satellite data (between 1998 to 2008) Across the physical environment Study Area the potential for stratification is higher in the nearshore environment with fronts frequency (long term summer average) between 30-101.2 between approximately 6 and 100 km offshore. The potential for stratification is lower in the waters associated with the OCS and Assets, with front frequency between 0.4-30 at these locations (Figure 6-3).

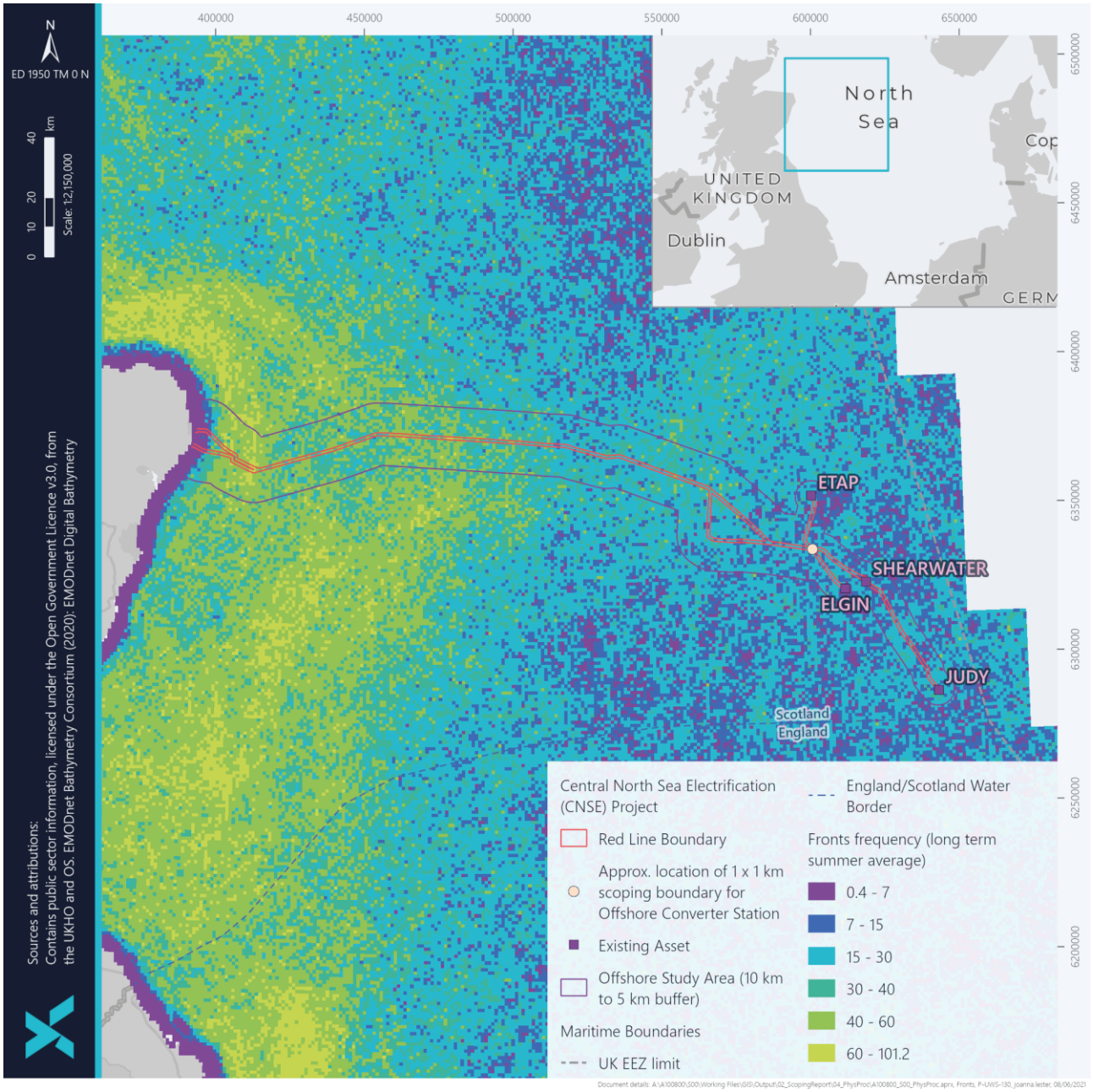

Figure 6-3 Potential for stratification across the physical environment Study Area (Miller and Christodoulou, 2014)

6.5.7 Wind Regime

The prevailing winds for the CNS are from the southwest. Across the physical environment Study Area, the mean wind speed ranges from approximately 8 m/s – 10 m/s (ABPmer, 2018). Across the physical environment Study Area the annual wind speed ranges from 6-10 m/s at the Marine Scheme landfall locations and approximately 27 km offshore. The rest of the physical environment Study Area is characterised by wind speeds of between 10-11 m/s. Throughout the summer months the mean wind speed ranges from 6.5 m/s – 8 m/s, with mean wind speeds during the winter months ranging from 9.3 m/s – 12.5 m/s (ABPmer, 2018).

The prevailing wind direction at the landfall locations is towards the south and southwest, with approximately 40% of winds at these locations prevailing in these directions. At the approximate location of the OCS, the prevailing wind direction is from the southwest to northwest, with over half of the recorded winds at this site prevailing in these directions. At the landfall locations gusts are dominated by speeds of between 2-16 m/s, with very few gusts exceeding 16 m/s. At the approximate location of the OCS, gusts are dominated by speeds of between 2 m/s and >16 m/s. The number of gusts at the approximate location of the OCS that exceed 16 m/s is significantly higher than winds recorded at either landfall location.

6.5.8 Coastal Characteristics

The Marine Scheme is located wholly within the CNS Regional Seas Cell 2 (Cairnbulg Point to Fife Ness) (Ramsay & Brampton, 2000) Subcell 2d (Girdle Ness to Cairnbulg Point) (Fitton *et al.*, 2017). A Vulnerability Assessment has been undertaken for Cell 2 to project the rate and extent of future erosion out to the year 2050. The Vulnerability Assessment concluded that an anticipated 79.0 hectares (Ha) will be lost by 2050 if the current rates of coastal erosion continue (Fitton *et al.*, 2017). Details of the coastal characteristics associated with the general Marine Scheme landfall locations is provided in Sections 6.5.8.1 and 6.5.8.2 below.

6.5.8.1 Sandford Bay

The Sandford Bay HVDC landfall location is characterised by a bedrock geology of granite and superficial deposits of gravel, sand and silt (BGS, 2023). The sands within the bay are considered to be erodible, however this is surrounded inland by non-erodible substrate (Dynamic Coast, 2023). Under the GHG high emissions (worst case) scenario of coastal erosion out to the year 2050, coastal erosion at the Sandford Bay landfall location is considered to be of greater risk at the extreme north and south of the bay, with a total potential eroded area extending inland up to 0.08 km in these areas (Dynamic Coast, 2023). Furthermore, the 2100 high emissions scenario identifies a total eroded area extending inland 0.03 km in the both the north and south, with potential erosion extending inland 0.1 km at both sites. Artificial coastal defences are located on the coast to the south of Sandford Bay (Dynamic Coast, 2023).

6.5.8.2 Longhaven

The Longhaven HVDC landfall locations are characterised by a bedrock geology of granite, with no superficial deposits (BGS, 2023). The coastline is classed as erosion-resistant rock and/or cliff, without loose eroded material in the fronting sea (EMODnet, 2023). The coastline is considered to be not erodible (Dynamic Coast, 2023). Under the GHG high emissions (worst case) scenario of coastal erosion out to the year 2100, coastal erosion at the Longhaven landfall locations is not considered to be a risk, with no eroded areas or potential areas of erosion identified (Dynamic Coast, 2023).

6.5.9 Designated Sites

There are four designated sites which directly intersect with the physical environment Study Area, these are the Southern Trench NCMPA, the Turbot Bank NCMPA, the Buchan Ness to Collieston SAC, and the East of Gannet and Montrose Fields NCMPA. Two of these designated sites will directly intersect with the Marine Scheme (the Buchan Ness to Collieston Coast SAC and the East of Gannet and Montrose Fields NCMPA). Table 6-2 presents the qualifying features of the sites within the Study Area which are relevant to the physical environment assessment.

Table 6-2 Designated Sites with a physical environment qualifying feature

Designated Site	Qualifying Feature Relevant to the Physical Environment
Southern Trench NCMPA	• Burrowed mud; • Fronts; • Shelf deeps; • Quaternary of Scotland; and • Submarine mass movement
East of Gannet and Montrose Fields NCMPA	• Offshore deep-sea muds

Designated sites within the vicinity of the physical environment Study Area are presented in Figure 6-4.

The degree of direct interaction between the Marine Scheme with these designated sites will be subject to the finalisation of the Marine Scheme by the Applicant. Any interaction between the Marine Scheme and a designated site will be fully assessed as part of the MPA Assessment, as appropriate (as outlined in Section 2.6).

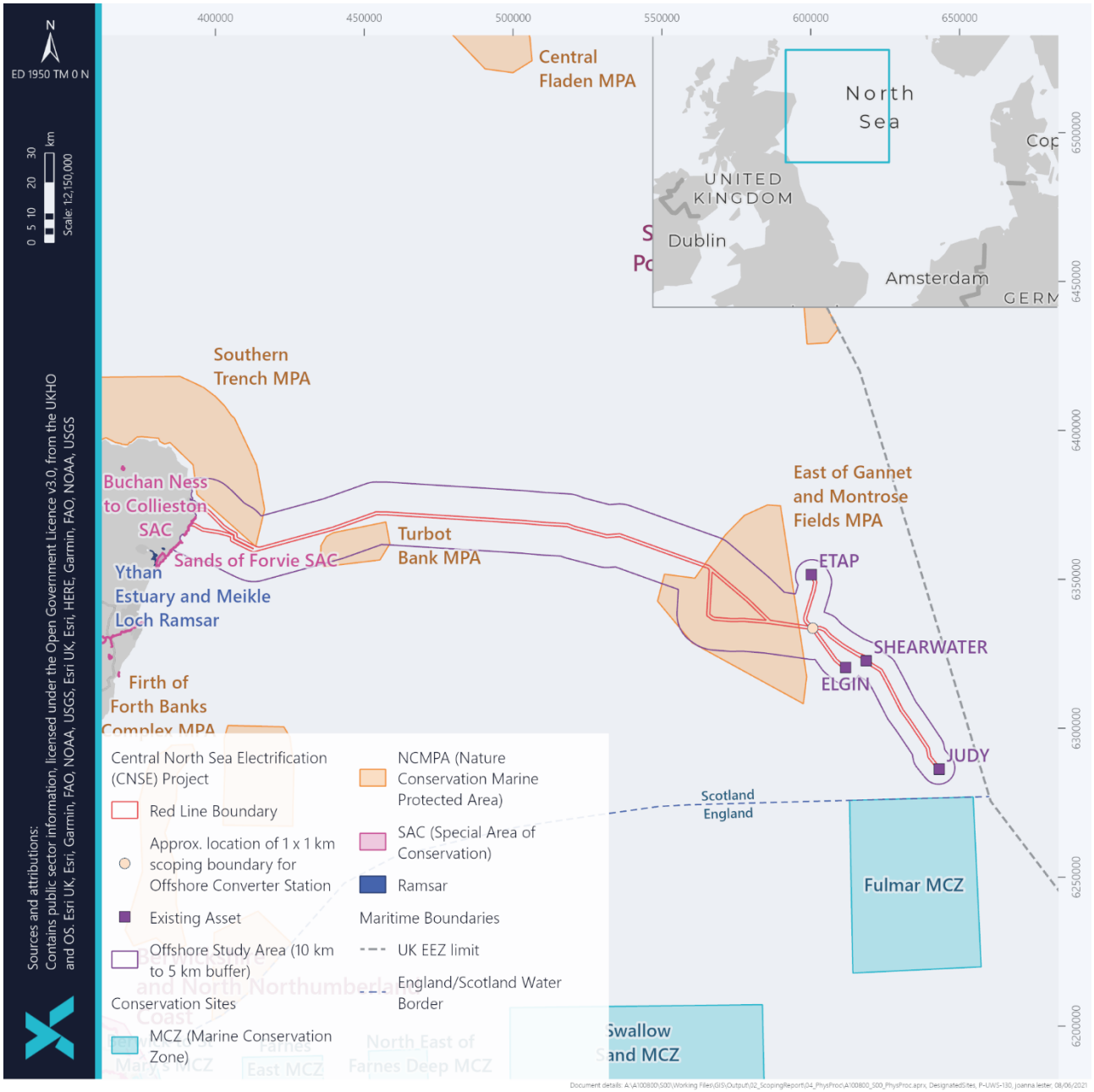

Figure 6-4 Designated sites in the vicinity of the physical environment Study Area

6.6 Embedded Mitigation

At this stage topic-specific measures have not been developed; however, certain measures have been proposed as part of the development process in line with industry best-practice to reduce the potential for impacts on the physical environment (Table 6-3). The embedded mitigation specific to physical environment receptors will be agreed upon by the Applicant and will be detailed within the EIAR. Unless otherwise indicated, the mitigation measures will be secured through the ML consent conditions.

Table 6-3 Embedded mitigation measures that are proposed as part of the Marine Scheme

Embedded Mitigation Measure	Form (Primary or Tertiary)
Develop and implement a CEMP, including a Marine Pollution Contingency and Control Plan.	Tertiary
Micro-routeing within the Marine Scheme will be carried out to help avoid or minimise interactions with localised engineering and environmental constraints (including avoidance of any identified seabed heritage assets and other features of archaeological significance). This decision making will be informed by CBRA.	Primary
Placement of scour protection for the OCS will be minimised as far as possible (supported by a scour assessment).	Primary
Pre-installation geophysical cable route surveys will be undertaken, the results of which will be used to identify the presence of morphological features of interest that may require additional mitigation.	Tertiary
The introduction of additional cable protection (e.g. rock) will be minimised as far as possible across the Marine Scheme	Primary

6.7 Scoping of Impacts

Activities associated with the installation, operation and maintenance, and decommissioning of the Marine Scheme have the potential to result in impacts to the physical environment (Table 6-4). A justification has been provided for each potential impact along with the proposed assessment method.

Table 6-4 Scoping of potential impacts relating to the physical environment

Potential Impact	Scoping Result	Justification	Information Required to Inform the Assessment	Assessment Method
Installation and Decommissioning				
Change to seabed levels and sediment properties due to cable installation and decommissioning works	Scoped in	There is the potential for pre-installation (including seabed preparation) and installation and decommissioning activities to result in localised changes to the seabed. This has the potential to result in impact pathways on other environment, biological and/or human receptors associated with the Marine Scheme. There is also the potential for localised changes to sediment type which may impact species which rely on the seabed.	Available data and information on surface and sub-surface geology, bathymetry and background SSC throughout the physical environment Study Area will be assessed. This regional data will be supplemented with site-specific geophysical survey data and publicly available metocean data.	Desk-based assessment, based upon PDE. No numerical modelling is proposed due to the existing understanding of the environmental interactions of offshore infrastructure off the east coast of Scotland with the physical environment and the limited scale of proposed activities associated with the Marine Scheme. Further detail on proposed analyses methods are described in Section6.9.
Increases to SSC due to the installation and decommissioning works	Scoped in	There is the potential for installation and decommissioning activities to result in localised sediment disturbance and increases in SSC. This has the potential to result in impact pathways on other biological receptors associated with the Marine Scheme (including water and sediment quality, benthic ecology and fish and shellfish ecology). Increased sedimentation associated with installation and decommissioning activities have the potential to result in smothering of slow moving or sessile species (e.g. ocean quahog, a designated feature of the East of Gannet and Montrose Fields NCMPA). Any potential increases in SSC and redistribution of suspended sediment are considered to be highly localised and temporary. However, as this potential impact is considered to be a pathway for potential impacts on other biological receptors in the marine environment it has been scoped in for further assessment as part of the EIAR.	The data and information sources described above will be assessed, including results from the baseline geophysical survey (Section 6.4).	Desk-based assessment, based upon the PDE. No numerical modelling is proposed due to the strong existing understanding of the environmental interactions of offshore infrastructure off the east coast of Scotland with the physical environment and the limited scale of proposed activities associated with the Marine Scheme. The desk-based assessment will use semi-quantitative tools as described in Section 6.9
Impacts on qualifying features of designated sites due to installation and decommissioning works	Scoped in	There are a number of designated sites which have a geological, morphological or oceanographic feature as one of their qualifying features (Section 6.5.9). There is the potential for activities relating to pre-installation, installation and decommissioning phases of the Marine Scheme to impact these designated sites thorough both direct and indirect pathways. These pathways include: direct seabed disturbance and loss; reduced water quality (as a result of increased SSC); potential smothering of sensitive habitats and organisms as a result of sediment depositions.	The bathymetry, representative tidal and wave properties of the marine physical environment and associated seabed conditions within the physical environment Study Area will be supplemented by site-specific geophysical survey data and publicly available metocean data.	A desk-based assessment will be undertaken considering the PDE, informed by a combination of analytical spreadsheet-based tools to determine the extent of the potential impact. An MPA assessment will be undertaken separately to consider the potential impacts of the Marine Scheme and associated activities on designated sites (as outlined in Section 2.6).
Changes to coastal landfall morphology	Scoped out	Cable installation activities within coastal environments have the potential to result in impacts to coastal morphology. However, as HDD is proposed at the cable landfall, there is limited opportunity for impacts on the coastline. The coastline at Sandford Bay, though classed as erodible, will not be affected by the HDD which will emerge offshore. Furthermore, HDD ducts will be limited in scale such that there will be no opportunity for this construction activity to influence coastal morphology. The coastline at Longhaven is not erodible and constitutes solid geology. Therefore, landfall activities will not affect this coastline. Furthermore, landfall activities will be limited in duration so disturbance will be temporary and will not result in impacts on coastal morphology. This potential impact is therefore scoped out.		

Potential Impact	Scoping Result	Justification	Information Required to Inform the Assessment	Assessment Method
Operation and Maintenance				
Introduction of scour	Scoped out	The intended method of cable installation is burial (where possible) with cable protection to be used where burial is not possible. With respect to the OCS, although there is the potential for scour to develop post-installation, in line with embedded mitigation measures (Section 6.6) a scour assessment study will be completed to determine the requirement for scour protection. Should the need be determined, scour protection would be installed at installation, thereby negating the development of scour. For this reason, it is proposed that the potential for the introduction of scour is scoped out from further assessment, associated with the presence of the OCS and the cables. This potential impact is therefore scoped out.		
Potential changes to the tidal, wave and sediment transport regime	Scoped in	Any potential impacts to physical processes arising from the operation and maintenance phase are likely to be limited to remediation works which may result in wider large-scale impacts to physical process pathways (including changes to local tidal, wave and sediment transport regimes). Works associated with the operation and maintenance phase are considered to be limited, with negligible impacts compared to those considered as part of the installation phase.	The physical environment Study Area bathymetry, representative water level and current speeds, wave properties and seabed sediments. Regional information will be supplemented by site-specific geophysical and geotechnical survey data and publicly available metocean data.	A desk-based assessment will be undertaken considering the PDE, informed by a combination of analytical spreadsheet-based tools to determine the extent of the potential impact. Modelling outputs from third-party projects or developments of relevance to the Marine Scheme will also be considered.
Changes to water column structure with impact to stratification	Scoped out	Any potential changes to wave and tidal regime at the sea surface or within the water column can result in increased water column mixing with changes to the occurrence of fronts or seasonal stratification. This in turn has the potential to give rise to onwards impacts to primary productivity across the CNS. There is the potential for this impact to arise only in relation to permanent infrastructure within the water column. However, the OCS is the only permanent infrastructure within the water column associated with the Marine Scheme. Therefore, the scale of the installation will not influence water column mixing. Furthermore, the OCS is located >200 km offshore where there is comparatively less evidence of front formation (Section 6.5.6). Consequently, there is no opportunity for the Marine Scheme to affect stratification processes. This potential impact is therefore scoped out.		

6.8 Potential Cumulative and Transboundary Impacts

Although the predicted impacts of the Marine Scheme are anticipated to be localised, there is the possibility that certain impacts from the Marine Scheme may interact with other projects, plans and activities, which could result in a cumulative effect on the physical environment. There is the potential for cumulative impacts on physical environment receptors during the installation phase of the Marine Scheme. The projects to be considered as part of the Cumulative Impact Assessment are summarised in Table 4-3. The assessment will be made based on information in the public domain, and in line with the methodology outlined in Section 4.

There is no potential for transboundary impacts on the physical environment to arise as a result of installation, operation and maintenance or decommissioning activities associated with the Marine Scheme. Any potential impacts associated with the Marine Scheme will be highly localised. Potential transboundary impacts on the physical environment are therefore proposed to be scoped out of the EIA and will not be assessed further within the EIAR.

6.9 Proposed EIA Methodology

The assessment of impacts arising from installation, operation and maintenance and decommissioning activities associated with the Marine Scheme will be assessed through a desk-based analysis of the publicly available data and information sources (as identified in Table 6-1). Additional consultation will be undertaken with key stakeholders including:

- MD-LOT;
- NatureScot;
- SEPA; and
- Aberdeenshire Council.

The EIAR will consider outputs from existing regional numerical modelling, such as that completed for existing offshore wind developments in the Moray Firth and Firth of Forth, along with desk-based reviews and developed analytical tools, to assess the magnitude of potential impacts on the physical environment and the likely significant effects to physical process receptors. A further description of the assessment methods in relation the impacts requiring assessment is as follows:

- Change to seabed levels and sediment properties: Will involve the examination of project specific surveys, alongside a desk-based study using publicly available geotechnical, geological and substrate data. Quantitative assessment of any seabed loss due to the installation of subsea infrastructure (mainly comprising protection measures). Should drilling be considered as an installation method for the OCS, the assessment will apply quantitative tools to estimate the degree and extent of potential deposition. In addition, the assessment will also complete a semi-quantitative assessment of the potential for alteration of the sediment type, based on the nature and properties of the geological substrate up to the target installation depth.
- Increase in SSC: Use of publicly available seabed sediment, SSC and available climatology data on flow properties (available from the Scottish Shelf Model or the Atlantic- European North West Shelf Ocean Physics Reanalysis data). Semi-quantitative analytical tools will be used to take account of tidal flow properties (speed and direction) and seabed sediment properties (size and settling velocities) in order to determine the lateral movement, spatial extent of sediment disturbed during installation activities and the magnitude of changes in SSC.

- Coastal and landfall morphology: Semi-quantitative desk-based analysis using publicly available coastal characterisation and processes data. Review of coastline positions from the data as well as quantification of sediment transport properties in line with metocean and seabed sediment information.
- Changes to tide, wave and sediment transport regime: Semi-quantitative desk-based analysis using available climatology data from the Scottish Shelf Model or the Atlantic-European North West Shelf Ocean Physics Reanalysis data, along with understanding from third-party developments close to the Marine Scheme to characterise the potential changes to flows and waves from the OCS. The understanding of the flow and wave regime along with publicly available information on seabed sediment, will inform the characterisation of the sediment transport regime. A semi-quantitative assessment of potential sediment transport blockage associated with installed infrastructure, based on standard guidance, such as that from the Construction Industry Research and Information Association (CIRIA) rock manual (CIRIA, 2007) will also be completed.
- Impacts to stratification: Qualitative assessment using available literature and evidence base from analogous projects, in addition to available water column properties from the Atlantic- European North West Shelf Ocean Physics Reanalysis data.

Where decommissioning activities are scoped into the EIA, it is anticipated that the activities will result in a reduced level of impact than those already considered during the installation phase.

The impacts of the Marine Scheme on the physical environment will be assessed based on the PDE.

EIA methodology for the physical environment will be conducted in line with the overall EIA methodology described in Section 4 and will be in accordance with the relevant legislation, policy, and standard industry and best-practice guidance.

6.10 Scoping Questions

The Applicant would request responses to the Greenfield scoping questions of relevance to Section 6. Physical Environment. Please respond to Questions 7-14 in Table 1-2.

6.11 Physical Environment: Brownfield

The baseline description for the physical environment (Section 6.5) does not differ between the Brownfield and the Greenfield Scope. Physical processes, such as the hydrodynamic regime, occur on a regional scale which does not differentiate between the Greenfield and Brownfield Scopes. The Brownfield Scope occupies a very small area relative to these wider processes (i.e. approximately 4 x 500 m safety zones or less than 0.2% of the area occupied by the Greenfield Scope).

Given the following:

- The activity associated with the Brownfield Scope, i.e. temporary installation vessel activity, installation of limited additional infrastructure (cable, cable protection and up to two BLPs) and infrequent short-term vessel activity associated with O&M
- That the activity will occur within an area of existing infrastructure (established oil and gas assets)

- The highly localised area within which activity will occur

it is concluded that no source-pathway-receptor route exists by which activity associated with the Brownfield Scope could appreciably impact on the physical environment. It is therefore proposed that physical environment receptors can be scoped out of further assessment associated with the Brownfield Scope.

Embedded mitigation relevant to the physical environment (Section 6.6) will be applied to the activities associated with the Brownfield Scope.

6.11.1 Brownfield Scoping Questions

The Applicant would request responses to the Brownfield scoping questions of relevance to Section 6. Physical Environment. Please respond to Question 5 in Table 1-3.

6.12 References

ABPmer. 2017. Atlas of UK Marine Renewable Energy, Interactive Map. Available online at: https://www.renewables-atlas.info/explore-the-atlas/

ABPmer. 2018. SEASTATES Metocean Data and Statistics Interactive Map. Available online at: https://www.seastates.net/explore-data/

Berx, B., Hughes, S. 2009. Climatology of Surface and Near-bed Temperature and Salinity on the North-West European Continental Shelf for 1971–2000 (2009). Available online at: https://data.marine.gov.scot/sites/default/files//berx-hughes_2009.pdf

BGS. 2023. British Geological Survey (BGS) geology of Britain viewer. Available online at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html

BODC. 2019. British Oceanographic Data Centre (BODC) Observational Conductivity Temperature Depth (CTD) Records. Available online at: https://www.bodc.ac.uk/

BODC. 2022. British Oceanographic Data Centre (BODC) data centre. Available online at: https://www.bodc.ac.uk/data/

Carpenter JR, Merckelbach L, Callies U, Clark S, Gaslikova L, Baschek B (2016) Potential Impacts of Offshore Wind Farms on North Sea Stratification. PLoS ONE 11(8): e0160830. doi:10.1371/journal.pone.0160830

Cazenave, P. W., Torres, R., and Allen, I. J., 2016. Unstructured grid modelling of offshore wind farm impacts on seasonally stratified shelf seas. Progress in Oceanography 145 (2016) 25–41. http://dx.doi.org/10.1016/j.pocean.2016.04.004

Cefas. 2016. Cefas Suspended Sediment Climatologies around the UK. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/584621/CEFAS_2016_Suspended_Sediment_Climatologies_around_the_UK.pdf

Cefas, 2023. Cefas WaveNet. Available online at: https://wavenet.cefas.co.uk/map

Christiansen *et al.* 2022. Emergence of Large-Scale Hydrodynamic Structures Due to Atmospheric Offshore Wind Farm Wakes. Available online at: https://doi.org/10.3389/fmars.2022.818501

Construction Industry Research and Information Association (CIRIA), 2007. The Rock Manual. The use of rock in hydraulic engineering, 2nd edition. CIRIA Special Publication Volume 83, CIRIA C683

Copernicus. 2022. European Union's earth observation programme. Available online at: https://www.copernicus.eu/en

DECC. 2016. UK offshore strategic environmental assessment 3 (OESEA3). Appendix 1D – water environment (Regional Sea 6 and 7). Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/504541/OESEA3_A1d_Water_environment.pdf

Dorrell *et al.* 2022. Anthropogenic Mixing in Seasonally Stratified Shelf Seas by Offshore Wind Farm Infrastructure. Available online at: https://doi.org/10.3389/fmars.2022.830927

DTI (2001). Report to the Department of Trade and Industry. Strategic Environmental Assessment of the Mature Areas of the Offshore North Sea SEA 2. Consultation Document.

Dynamic Coast. 2023. Dynamic Coast Webmaps. Available online at: https://www.dynamiccoast.com/webmaps

EMODnet, 2023. EMODnet Map Viewer. Available online at: https://emodnet.ec.europa.eu/geoviewer/#!/

Fitton, J.M., Rennie, A.F., Hansom, J.D. 2017. Dynamic Coast – National Coastal Change Assessment: Cell 2 – Fife Ness to Cairnbulg Point, CR2014/2. Available online at: https://www.dynamiccoast.com/files/reports/NCCA%20-%20Cell%202%20-%20Fife%20Ness%20to%20Cairnbulg%20Point.pdf

JNCC. 1996. Coasts and seas of the United Kingdom, Region 3 North-eat Scotland: Cape Wrath to St. Cyrus. Available online: https://data.jncc.gov.uk/data/6473ed35-d1cb-428e-ad69-eb81d6c52045/pubs-csuk-region-03.pdf

Kenyon, H., Cooper, B. 2005. DTI technical report: sandbanks, sand transport and offshore wind farms. Available online at: https://tethys.pnnl.gov/sites/default/files/publications/Keny-et-al-2005.pdf

Marine Scotland. 2022. Marine Scotland Data Portal. Available online at: https://marine.gov.scot/data/marine-scotland-data-portal

Marine Scotland. 2023. National Marine Plan Interactive (NMPi). Available online at: https://marinescotland.atkinsgeospatial.com/nmpi/

Marine Scotland & Scottish Government. 2019. Scottish coastal observatory. Available online at: https://marine.gov.scot/data/scottish-coastal-observatory-data

Miller and Christodoulou. 2014. Frequent locations of oceanic fronts as an indicator of pelagic diversity: Application to marine protected areas and renewables. Marine Policy, 45, 318-329.

Met Office. 2022. UK Climate Projections (UKCP) 18. Available online at: https://www.metoffice.gov.uk/research/approach/collaboration/ukcp

Norwegian Petroleum Directorate. (2021). Geology of the North Sea. Available online at: https://www.npd.no/en/facts/publications/co2-atlases/co2-atlas-for-the-norwegian-continental-shelf/4-thenorwegian-north-sea/4.1-geology-of-the-northsea/#:~:text=The%20basic%20structural%20framework%20of%20the%20North%20Sea,deposition%20of%20reddish%20eolian%20and%20fluvial%20sandstones%20%28Rotliegendes%

NTSLF. 2020. National Tidal and Sea Level Facility – observational water level records. Available online at: https://www.ntslf.org/

Ramsay, D. L., & Brampton, A. H., 2000. Coastal cells in Scotland: Cell2 – Fife Ness to Cairnbulg Point. Available online at: https://www.dynamiccoast.com/files/Ramsay_Brampton_Cell_02.pdf

Saha, S., *et al.* 2010. The NCEP Climate Forecast System Reanalysis, Bull. Am. Meteorol. Soc., 91(8), 1015–1057, doi:10.1175/2010BAMS3001.1.

Schultze, L., Merckelbach, L., Horstmann, J., Raasch, S., and Carpenter, J. (2020). Increased mixing and turbulence in the wake of offshore wind farm foundations. J. Geophys. Res. Oceans 125, e2019JC015858. doi: 10.1029/2019JC015858

Scottish Government. 2020. Sectoral Marine Plan: Regional Local Guidance. Available online at: https://www.gov.scot/publications/sectoral-marine-plan-regional-locational-guidance/documents/

Scottish Government. 2022. Scottish remote sensing portal. Available online at: https://remotesensingdata.gov.scot/

SEPA. 2022. Scottish Environment Protection Agency (SEPA) flood risk maps. Available online at: https://www.sepa.org.uk/environment/water/flooding/flood-maps/

SNH. 2017. Scottish Government Dynamic Coast: Scotland's National Coastal Change Assessment Map. Available online at: https://www.dynamiccoast.com/webmaps

UKHO. 2017. United Kingdom Hydrographic Office (UKHO) admiralty chart data & UKHO INSPIRE bathymetric data. Available online at: https://datahub.admiralty.co.uk/portal/apps/webappviewer/index.html

UKHO. 2020. Admiralty total tide (ATT) tidal predictions software: UK Hydrodynamic Office (UKHO) Admiralty Maritime Data Solutions.

UKHO. 2020. United Kingdom Hydrographic Office (UKHO) Admiralty Tide Tables. Available online at: https://www.admiralty.co.uk/publications/publications-and-reference-guides/admiralty-tide-tables

Van Leeuwen *et al.* 2015. Stratified and nonstratified areas in the North Sea: Long-term variability and biological and policy implications. Available online at: https://doi.org/10.1002/2014JC010485

7 WATER AND SEDIMENT QUALITY

7.1 Introduction

This section of the Scoping Report presents the water and sediment quality receptors of relevance to the Marine Scheme and highlights the potential impacts of the Marine Scheme on water and sediment quality receptors during installation, operation and maintenance and decommissioning phases.

The water and sediment quality receptors considered within this section include designated waterbodies, bathing waters, shellfish water protected areas, urban wastewater treatment sensitive areas, and Nitrate Vulnerable Zones (NVZs) as well as the sediment quality within the vicinity of the Marine Scheme.

This section of the Scoping Report should be read in conjunction with the following sections:

- Section 8 Benthic Ecology;
- Section 9 Fish and Shellfish Ecology;
- Section 10 Ornithology;
- Section 11 Marine Mammals; and
- Section 12 Commercial Fisheries.

7.2 Legislation, Policy and Guidance

In addition to the relevant policy and legislation described in Section 2, the following section outlines the legislation, policy and guidance that will be taken into consideration in relation to the water and sediment quality EIA.

7.2.1 National Legislation

UK

- Food and Environment Protection Act 1985; and
- Marine Strategy Regulations 2010;

Scotland

- Urban Waste Water Treatment (Scotland) Regulations 1994;
- Water Environment and Water Services (Scotland) Act 2003;
- Action Programme for Nitrate Vulnerable Zones (Scotland) Regulations 2008;
- The Bathing Waters (Scotland) Regulations 2008;
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended);
- The Pollution Prevention and Control (Scotland) Regulations 2012;
- The Water Environment (Shellfish Water Protected Areas: Designation) (Scotland) Order 2013; and
- Environmental Authorisations (Scotland) Regulations 2018.

7.2.2 Guidance

- Coastal and marine environmental site guide (Environment Agency, 2003);
- Centre for Environment, Fisheries and Aquaculture Science (Cefas) Offshore Wind Farms: Guidance Note for Environmental Impact Assessment in Respect of Food and Environmental Protection Act (FEPA) and Coast Protection Act (CPA) Requirements: Version 2 (Cefas, 2004);
- Land Use Planning System Scottish Environment Protection Agency (SEPA) Guidance Note 17: Marine development and marine aquaculture planning guidance, Version 6 (SEPA, 2014);
- Supporting Guidance (WAT-SG-53) Environmental Quality Standards and Standards for Discharges to Surface Waters (SEPA, 2020a); and
- SEPAs Guidance for Pollution Prevention (GPPs) (currently being updated).

7.3 Study Area

The water and sediment quality offshore Study Area is based on the physical environment Study Area as detailed in Section 6 Physical Environment. The water and sediment quality Study Area varies across the Marine Scheme, with a 10 km buffer applied to the Marine Scheme from MHWS to 65 km offshore and a 5 km buffer applied from 65 km offshore to the OCS and Assets.

7.4 Key Data Sources

The existing data sets and literature with relevant coverage to the Marine Scheme, which have been used to inform this Scoping Report are outlined in Table 7-1.

Table 7-1 Data sources for the water and sediment quality assessment

Title	Source	Author	Year
Waterbody data sheets	https://www2.sepa.org.uk/WaterBodyDataSheets/	SEPA	2012
Monthly average non-algal Suspended Particulate Matter concentrations on the UK shelf waters	https://www.cefas.co.uk/data-and-publications/dois/monthly-average-non-algal-supended-particulate-matter-concentrations/	Cefas	2016a
Suspended Sediment Climatologies around the UK	CEFAS_2016_Suspended_Sediment_Climatologies_around_the_UK.pdf (publishing.service.gov.uk)	Cefas	2016b
OSPAR Intermediate Assessment 2017 – Contaminant assessments	https://www.sepa.org.uk/media/490771/191219_scotlands-water-environment-final.pdf	OSPAR	2017
Scotland's water environment 2019: A summary and progress report	https://www.sepa.org.uk/media/490771/191219_scotlands-water-environment-final.pdf	SEPA	2019

Title	Source	Author	Year
Urban Waste Water Treatment Directive Sensitive Areas Map 2019	https://www.gov.uk/government/publications/urban-waste-water-treatment-updated-sensitive-areas-maps-2019	SEPA	2020a
Dynamic Coast 2	[Dynamic Coast - Coastal Erosion in Scotland] | CREW | Scotland's Centre of Expertise for Waters	Centre of Expertise for Waters (CREW)	2021
Scotland's National Marine Plan Interactive	https://marinescotland.atkinsgeospatial.com/nmpi/	Marine Scotland	2023
Annual updates on the condition of the water environment	https://www.sepa.org.uk/data-visualisation/water-classification-hub	SEPA	2023a
Water Framework Directive (WFD) River Basin Management Plan (RBMP) Waterbody status	https://www.sepa.org.uk/data-visualisation/water-environment-hub/	SEPA	2023b
Scotland's Environment data tool for Bathing Waters	https://www2.sepa.org.uk/bathingwaters/	SEPA	2023c
Cefas Sediment Management Framework prototype Action Levels Viewer	https://rconnect.cefas.co.uk/action_levels_tool/	Cefas	2021
Nitrates Monitoring	https://www.sepa.org.uk/environment/water/monitoring/nitrates-monitoring/	SEPA	2023d
Nitrate Vulnerable Zones (NVZs)	https://www.gov.scot/policies/agriculture-and-the-environment/nvz/	Scottish Gov	
Greenfield CNSE Habitat Assessment Report	Ref 11823.E04	Gardline	2023
Greenfield CNSE Environmental Baseline Survey Report	Ref 11823.E03	Gardline	2023

7.5 Baseline Environment

7.5.1 Water Quality

SEPA is responsible for producing and implementing River Basin Management Plans (RBMPs) under the Water Environment and Water Services (Scotland) Act, 2003. River basins comprise all surface waters (including transitional (estuaries) and coastal waters) extending to 5.5 km (3 NM) seaward from the Scottish territorial baseline. Any proposed development within these waters must have regard to the requirements of the Water Framework Directive to ensure that all surface water bodies achieve 'Good Ecological Status' and that there is no deterioration in status. Five classifications of water quality status are defined: High (near natural), Good, Moderate, Poor and Bad; and each classification is accorded a degree of confidence (high, medium or low) in the overall quality assessment.

Water quality within the water and sediment quality offshore Study Area has been determined through evaluation of 'designated waters' which include designated waterbodies, designated bathing waters, designated shellfish waters, and nitrate sensitive areas (i.e., urban wastewater treatment sensitive areas and NVZs). For the purpose of this scoping report, 'designated waters' is the collective term for all designations and the basis for which the scoping assessment is completed. Designated waters that intersect the Marine Scheme or water and sediment quality offshore Study Area are illustrated in Figure 7-1.

Suspended sediment concentrations (SSC) ($1x10^{-3}$ kg/m) throughout the water and sediment quality offshore Study Area range from 0.08-1, with SSC in the water associated with the OCS ranging from 0.08-0.6 and 0.8-1 at the Marine Scheme landfall locations (see Section 6 Physical Environment). Any increase in SSC as a result of the Marine Scheme would be well within the Study Area defined offshore and although this elevation nearshore may extend further (due to more active physical processes, see Section 6), this would be short-lived and return to background levels within hours of completion. Therefore, any increase in SSC would be temporary, transient, and localised and would not result in any change to water and sediment quality status.

7.5.1.1 Designated Waterbodies

The Marine Scheme directly overlaps with the following coastal water bodies (Figure 7-1).

- Ugie Estuary to Buchan Ness (Peterhead) (ID: 200131); and
- Buchan Ness to Cruden Bay (ID: 200125).

The Ugie Estuary to Buchan Ness (Peterhead) water body has an area of 46.3 km^2 and has been designated as a heavily modified water body on account of physical alterations that cannot be addressed without a significant impact on navigation (SEPA, 2023b). As of the most recent data (2020), this water body is in 'Good' overall status with a 'Moderate' overall ecology (SEPA, 2023a). The most recent overall chemistry status is from 2012, in which this water body had a status of 'Pass' with 'Low' confidence (SEPA, 2012). The water body condition projection from 2014, 2021, and future projections (Table 7-2) list the overall condition, physical condition, and water quality condition as in 'Good' status and freedom from invasive species as in 'High' status (SEPA, 2023b).

The Buchan Ness to Cruden Bay water body has an area of 57.9 km^2 (SEPA, 2023b). No pressures have been identified on this water body (SEPA, 2012). As of the most recent data (2020), this water body is in 'High' overall status with a 'High' overall ecology status (SEPA, 2023a). The most recent overall chemistry status is from 2012, in which this water body had a status of 'Pass' with 'Low' confidence (SEPA, 2012). The water body condition projection from 2014, 2021, and future projections (Table 7-2) list the overall condition, physical condition, water quality condition, and freedom from invasive species as in 'High' status (SEPA, 2023b).

Additionally, the following coastal water body is within the water and sediment quality offshore Study Area but does not directly overlap with the Marine Scheme:

- Cairnbulg Point to the Ugie Estuary (ID: 200142) (127.9 km^2);
- Cruden Bay (ID: 200118) (19.3 km^2); and
- Cruden Bay to the Don Estuary (ID: 200117) (149.4 km^2).

The Cairnbulg Point to the Ugie Estuary, Cruden Bay, and Cruden Bay to the Don Estuary coastal water bodies are in 'High' overall status with a 'High' overall ecology status (SEPA, 2023a). No pressures have been identified on these water bodies (SEPA, 2012). The most recent overall chemistry status for these water bodies is from 2012, in which this water body had a status of 'Pass' with 'Low' confidence (SEPA, 2012). The water body condition projection from 2014, 2021, and future projections list the overall condition, physical condition, water quality condition, and freedom from invasive species as in 'High' status for these water bodies (SEPA, 2023b).

Table 7-2 Summary of the condition of designated waterbodies which directly coincide with the Marine Scheme (SEPA, 2023b)

Site	Condition	2014	2021	2027	Long Term
Ugie Estuary to Buchan Ness (Peterhead)	Overall	Good	Good	Good	Good
	Physical condition	Good	Good	Good	Good
	Freedom from invasive species	High	High	High	High
	Water quality	Good	Good	Good	Good
Buchan Ness to Cruden Bay	Overall	High	High	High	High
	Physical condition	High	High	High	High
	Freedom from invasive species	High	High	High	High
	Water quality	High	High	High	High

7.5.1.2 Designated Bathing Water

No designated bathing waters overlap with the Marine Scheme, however, there are two designated bathing waters within the water and sediment quality offshore Study Area, which are the Peterhead (Lido) site (ID: UKS7616042) and the Cruden Bay site (ID: UKS7616093) (Figure 7-1).

The Peterhead (Lido) bathing water is currently listed in 'Excellent'[9] status for 2022 / 2023 and has been listed as 'Good' or 'Excellent' status in previous years (Table 7-3), and the Cruden Bay bathing water is listed in 'Good' status for 2022 / 2023, similar to that of previous years (Table 7-3).

[9] *The annual bathing water classification is determined using statistics (average value and range of values) calculated from results taken over the previous four years. The water quality indicators SEPA test for are the bacteria Escherichia coli (E. Coli) and Intestinal enterococci (IE). Single sample results above 500 E. Coli and 200 IE are indicative of low water quality when the sample was taken (SEPA, 2022a).*

Table 7-3 Summary of the condition of designated bathing water (SEPA, 2022a; SEPA, 2022b)

Site	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Peterhead (Lido)	Good	Excellent	Excellent	No data	Excellent	Excellent
Cruden Bay	No data	No data	Good	No data	Good	Good

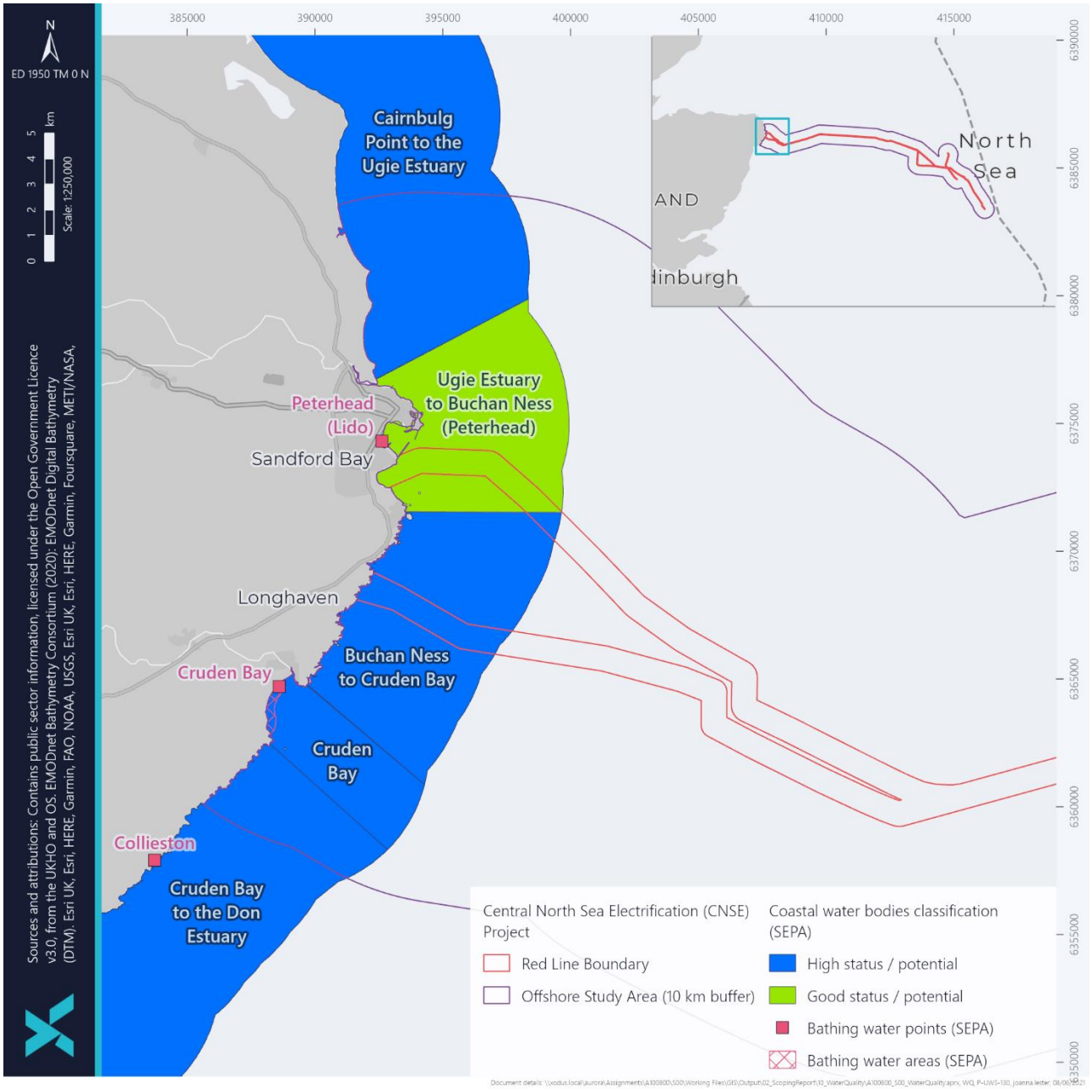

Figure 7-1 Designated coastal waterbodies and designated bathing water in the water and sediment quality offshore Study Area

7.5.1.3 Designated Shellfish Water Protected Areas

There are no designated shellfish water protected areas within the water and sediment quality offshore Study Area. The nearest designated shellfish water protected areas are within the inner Moray Firth at the Cromarty Bay (ID: SWPA11; overall status: 'Fair') and Dornoch Firth (ID: SWPA13; overall status: 'Fair') sites; however, these sites are

>130 km from the Marine Scheme and therefore no impacts to designated shellfish water protected areas are anticipated.

7.5.1.4 Nutrient Sensitive Areas

Nutrient sensitive areas comprise of NVZs and polluted waters designated under the Nitrates Directive (91/676/EEC) and areas designated as sensitive areas under the Urban Waste Water Treatment Directive (91/271/EEC). Each of these designations and any sites within the water and sediment quality offshore Study Area are considered in the sections below.

7.5.1.5 Urban Wastewater Treatment Sensitive Areas

According to the Urban Waste Water Treatment Directive Sensitive Areas Map 2019 for Scotland (SEPA, 2020b), the urban wastewater treatment sensitive areas within the water and sediment quality offshore Study Area includes the designated bathing waters as described in Section 7.5.1.2 and a river, the River Ugie. No further classification or management information is available for these sites.

7.5.1.6 Nitrate Vulnerable Zones

The primary source of nitrate is from agricultural diffuse pollution (SEPA, 2023d). Areas where nitrate concentrations in groundwater exceed, or are likely to exceed, the standard level (50 mg/l) set out in Nitrates Directive (91/676/EEC) are designated as NVZs (SEPA, 2023d; Scottish Government, 2023). There are currently five NVZs designated in Scotland. The Scottish Government reviews designations every four years, and SEPA monitors the nitrate concentrations in the surface and ground waters. Action Programmes, under the Action Programme for Nitrate Vulnerable Zones (Scotland) Regulations 2008, are enforced within the NVZs to reduce nitrate input into the water environment through requiring land managers to comply with measures associated with fertiliser, manure, compost and to prepare and implement a Fertiliser and Manure Management Plan. NVZs are mainly terrestrial and associated with agricultural lands; however, the waterways connect to the coastline, and excess nitrate concentrations can lead to algal blooms and eutrophication in estuaries and transitional waters. The water and sediment quality offshore Study Area overlaps with the Aberdeenshire, Banff, Buchan and Moray Nitrate Vulnerable Zone (NVZ) (Scottish Government, 2015) which the Marine Scheme intersects at landfall.

7.5.2 Sediment Quality

There are no known sediment quality issues within the water and sediment quality offshore Study Area. The Marine Scotland assessment of the UK's Clean Seas Environment Monitoring Programme (CSEMP) describes the status and trends of contaminant concentrations and biological effects measurements in biota and sediment at monitoring stations in waters around the UK. The most recent assessment is from April 2020 using data spanning 1999 to 2019 (BODC, 2020). The Marine Scheme is located in the East Scotland Coast monitoring region for the CSEMP[10]. There are no fixed CSEMP sites or strata recording sediment contaminants for the East Scotland Coast region. The closest monitoring sites are located at the Outer Moray Firth Station, both of which are located >80 km from the Marine Scheme. These sites are beyond the water and sediment quality offshore Study Area and therefore are unable to provide meaningful conclusions on sediment quality based on their available data.

[10] *CSEMP monitoring regions map available online at: https://marine.gov.scot/datafiles/csseg_assessment/2020/CSEMP_regions.pdf*

Review of available information on contaminants in Scottish waters from the Cefas Sediment Management Framework prototype Action Level viewer, indicated that there were no samples or contaminant information within the Marine Scheme or water and sediment quality Study Area (Cefas, 2021). The closest occurrence of any contaminants were located within the River Tay, >100 km south of the proposed landfalls.

7.6 Embedded Mitigation

At this stage topic-specific measures have not been developed; however, certain measures have been proposed as part of the development process in line with industry best-practice to reduce the potential for impacts to water and sediment quality (Table 7-4). The embedded mitigation specific to water and sediment quality receptors will be agreed upon by the Applicant and will be detailed within the EIAR. Unless otherwise indicated, the mitigation measures will be secured through the ML consent conditions.

Table 7-4 Proposed embedded mitigation measures

Embedded Mitigation	Type (Primary or Tertiary)
Develop and implement a CEMP, including a Marine Pollution Contingency and Control Plan.	Tertiary
Compliance with the International Convention for the Prevention of Pollution from Ships (MARPOL) regulations and best-practise protocols to prevent and manage incidents of accidental release of marine contaminants.	Tertiary

7.7 Scoping of Impacts

Potential impacts have been identified and considered based on professional experience, the PDE, relevant third-party environmental reports (as summarised in Section 7.4) and the understanding of the water and sediment quality baseline. The potential impacts for water and sediment quality receptors are summarised in Table 7-5. All potential impacts have been scoped out, as further explained in Section 7.7.1.

Table 7-5 Scoping of potential impacts relating to water and sediment quality receptors

Potential Impact	Scoping Result	Justification	Information Required to Inform the Assessment	Assessment Method
Installation and Decommissioning				
Impacts on water quality status of designated waters	Scoped out	Increases in SSC or disturbance effects associated with installation activities for the Marine Scheme would be temporary and localised as discussed in Section 7.7.1. Therefore, there will be no changes in water or sediment quality of designated waters due to the temporary, limited spatial extent and transient nature of the installation activities associated with the Marine Scheme, as detailed further in Section 7.7.1 below. Impacts arising during the decommissioning phase of the Marine Scheme would be temporary and occur over a short period and are expected to be similar to or less than those anticipated during installation. The potential impact is therefore scoped out.		
Changes in water and sediment quality due to accidental discharges from vessels during installation and decommissioning	Scoped out	Although installation activities associated with the Marine Scheme may potentially result in reduced water and sediment quality in the vicinity due to accidental discharges from vessels, any such incidents would be short lived and very localised. It is also anticipated that the risk will be entirely managed through the embedded mitigation measures presented in Section 7.6. Further justification for scoping this impact out is presented in Section 7.7.1.2. Impacts arising during the decommissioning phase of the Marine Scheme would be temporary and occur over a short period and are expected to be similar to or less than those anticipated during installation. The potential impact is therefore scoped out.		
Operation and Maintenance				
Impacts on water quality status of designated waters	Scoped out	There will be no changes in water or sediment quality of designated waters as a result of operation and maintenance activities. In the nearshore for the HVDC Cables that intersect designated waters, once buried, the cables do not typically require routine maintenance. The cables will be inspected to monitor condition and burial, but this will be done using offshore surveys and remotely operated underwater vehicles (ROVs). If inspection found that work was required, maintenance activities would likely include re-positioning of burial protection or placing additional protection. Such remedial measures may result increases to SSC and disturbance effects, however, there would be highly localised and temporary and is unlikely to alter the status of designated water as detailed in Section 7.7.1 below. In terms of the OCS and HVAC Cables further offshore, there is no pathway for effects to designated waters, as discussed in Section 7.7.1. The potential impact is therefore scoped out.		
Changes in water and sediment quality due to accidental discharges from vessels during and OCS operation and maintenance	Scoped out	As for the installation phase, although operation and maintenance activities associated with the Marine Scheme may potentially result in reduced water and sediment quality in the vicinity due to accidental discharges from vessels, any such incidents would be short lived and very localised. With respect to the OCS, it will be unmanned throughout the operation and maintenance phase of the Marine Scheme. Therefore, there is no opportunity for accidental discharges from the OCS during this time. It is again anticipated that the risk will be entirely managed through the embedded mitigation measures presented in Section 7.6. Further justification for scoping this impact out is presented in Section 7.7.1.2. The potential impact is therefore scoped out.		

7.7.1 Scoping Assessment Justification

7.7.1.1 Impacts on water quality status of designated waters

Changes to SSC and water quality may occur as a result of the pre-installation and installation activities for the OCS, HVAC Cables, and HVDC Cables. As detailed in the Project Description (Section 3), pre-installation activities may include site clearance (utilising subsea plough, pre-lay grapnel run, or grab techniques), pre-sweep (utilising mass-flow excavator), and/or unexploded ordnance clearance. HDD will be used to construct cable landfall. Cable installation will involve cable lay and burial, with the additional installation of cable protection should it be required. Cable installation is to entail a maximum of up two 220 km HVDC Cables to landfall and up to five HVAC Cables (up to total off 185 km), installed through the use of cable plough, jet trencher, mechanical cutting trencher or mass flow excavator. The cable trench will be up to 1 m wide with a trench target depth of 1.5 m, the installation tool will have a disturbance width of up 25 m. The OCS will involve an initial installation of a piled jacket foundation (70 x 40 m base dimensions) consisting of up to six legs (4 m diameter) and three piles per leg (3 m diameter). Although installation of the OCS foundation is likely to be through hammer piling, there is also the potential for drilling should it be necessary due to pile refusal.

HVDC Cables installation activities to landfall would only occur over a few months. Therefore, any increases in SSC with potential onward impacts to water quality status of designated waters will be temporary and return to background levels. Standard best practice and industry guidance will be applied during installation and decommissioning. Only substances approved for use in the marine environment will be used at the proposed landfall location. Bentonite, should it be required as part of construction activities at landfall, is a PLONOR substance[11].

As the cable installation works proceed offshore, any disturbance would be localised to within a few hundreds of metres to a few kilometres from the cable installation and disturbance site and would be transient as installation progressed. There is no evidence for contaminants in sediments within or in the vicinity of the Marine Scheme based on publicly available data (Section 7.5.2). Site-specific surveys (Gardline, 2023a) found that total hydrocarbon concentrations (THC) ranged from a minimum of 1.1µg g^{-1} to a maximum of 16.4µg g^{-1}, with a mean of 6.3µg g^{-1} (±3.3SD) - generally below the thresholds expected to impact benthic macrofauna. PAH concentrations were well below their respective effects range low concentrations (Long *et al.*, 1995) and apparent effects threshold (AET; Buchman, 2008). All metal concentrations were below their respective Buchman (2008) AETs, where data were available. Should drilling be used for the OCS, the increase in SSC or disturbance effects could extend across the tidal excursion, which has been determined to be a few kilometres (Section 7.3), with sediment resettling and concentrations returning back to background levels after a period of on cessation of drilling.

Thus, there is considered to be little to no potential for the Marine Scheme to result in impacts on the water quality status of designated waters based on the proposed installation, operation and maintenance, and decommissioning activities. Although activities associated with the Marine Scheme may result in changes to SSC, these would be temporary, highly localised and transient both in the nearshore and offshore. The short duration of sediment disturbance associated with cable installation activities is also not enough to alter the status of the designated waters, as the clearance and installation disturbance would be akin to the occurrence and seabed mixing caused by storm events. Installation activities associated with the OCS and HVAC Cables would be too far away, with no pathway for

[11] *PLONOR chemicals are those which pose little or no risk to the environment according to OSPAR, i.e. the mechanism by which 15 Governments and the EU cooperate to protect the marine environment of the North-East Atlantic.*

impacts to the coastal designated waters. The following sections consider the pathways for impacts to the designated waters within the water and sediment quality offshore Study Area and the justification for scoping the impact out.

7.7.1.1.1 Designated waterbodies

The Marine Scheme will intersect the Ugie Estuary to Buchan Ness (Peterhead) and Buchan Ness to Cruden Bay coastal water bodies; however, these designated waterbodies are currently listed as in 'Good' and 'High' status respectively and have maintained 'Good' and 'High' status over the previous years. The Ugie Estuary to Buchan Ness (Peterhead) coastal water body is noted to have pressure associated with being heavily modified; however, only one HVDC Cables will intersect this water body resulting in a small footprint. There are no pressures identified on the Buchan Ness to Cruden Bay coastal water body, and only one HVDC Cables will intersect this water body resulting in a small footprint as well. The Cairnbulg Point to the Ugie Estuary, Cruden Bay, and Cruden Bay to the Don Estuary are within the wider water and sediment quality offshore Study Area; however, the Marine Scheme will not intersect these water bodies and therefore any potential impact is considered to be temporary and transient. All three designated waterbodies are listed in 'High' overall status. and there are no pressures identified on these waterbodies.

Based on the extent and scale of the installation, operation and maintenance, and decommissioning activity described in Section 7.7.1.1, the current status of the designated waterbodies, and the limited pressure to these designated water bodies, the Marine Scheme is unlikely to result in a potential impact capable of altering the status of these designated waterbodies.

7.7.1.1.2 Designated bathing waters

The Marine Scheme will not intersect any designated bathing waters, and therefore any potential impact is considered to be minimal. There are two designated bathing waters present in the wider water and sediment quality offshore Study Area, Peterhead (Lido) and Cruden Bay, which are in 'Excellent' and 'Good' condition respectively and have maintained 'Excellent' or 'Good' status over the previous years. Based on the extent and scale of the installation, operation and maintenance, and decommissioning activity described in Section 7.7.1.1, the status of the designated bathing waters, and given that the Marine Scheme will not directly intersect these bathing waters, the Marine Scheme is unlikely to result in a potential impact capable of altering the status of these designated bathing waters.

7.7.1.1.3 Designated shellfish water protected areas

There are no designated shellfish water protected areas in the water and sediment quality offshore Study Area, and the distance between the Marine Scheme and the designated shellfish water protected areas means there is no pathway for impact from the Marine Scheme.

7.7.1.2 Changes in water and sediment quality due to accidental discharges from vessels

There is again considered to be little to no potential for the Marine Scheme to result in impacts to water and sediment quality due to accidental discharges from vessels. This is based on the scale and extent of the installation, operation and maintenance, and decommissioning activities as described in Section 7.7.1.1 above, and the embedded mitigation presented in Section 7.6. All project phase activities associated with the Marine Scheme will be localised and temporary as demonstrated with respect to designated waters. With the addition of implicit vessel and environmental management protocols in line with international standards, this will inherently limit the risk from vessel discharges and any onward impacts to water and sediment quality.

7.7.1.3 Conclusion

Overall, it is proposed that the water and sediment quality topic is scoped out from further assessment within the EIA. This is based on the assessment of the very limited potential for impacts of the Marine Scheme on water and sediment quality receptors, in particular designated waters which are largely at the coast. There is no pathway for impacts from the offshore elements of the Marine Scheme (inclusive of the OCS) to the designated waters at the coast. Although the HVDC Cables would intersect designated waters, only two such cables are to be installed which would result in a small footprint compared to the overall area of the designated waters. Furthermore, installation phase works would be of a short duration and transient. Should remedial work be required to the cables during the operation and maintenance phase, remedial works would be at an even smaller scale, and highly localised. Any potential vessel discharges would be short lived and localised, and it is anticipated that the risk will be entirely managed through the embedded mitigation measures as detailed in Section 7.6.

7.8 Potential Cumulative and Transboundary Impacts

As presented in Section 7.7.1, impacts from installation activities, increases in SSC or potential for contaminant disturbance, would be localised, temporary and transient. The relatively small tidal excursion distance, defining the water and sediment quality Study Area buffer around the Marine Scheme means impacts would largely be in the immediate vicinity of the Marine Scheme. Operational impacts were again considered to be less than that assessed for installation. Should any potential impacts (from any phase of the Marine Scheme) interact with that from other projects, the small scale of the Marine Scheme is such that it will not ultimately lead to status impacts to designated waters or changes in water and sediment quality as assessed in Section 7.7.

There is no potential for transboundary impacts on water and sediment quality receptors to arise as a result of installation, operation and maintenance or decommissioning activities associated with the Marine Scheme. Any potential impacts associated with the Marine Scheme will be highly localised.

7.9 Proposed EIA Methodology

Based on the results of the scoping of impacts in Section 7.7 above, an EIA for water and sediment quality is not required as any potential impacts of the Marine Scheme on water and sediment quality have been scoped out.

7.10 Scoping Questions

The Applicant would request responses to the Greenfield scoping questions of relevance to Section 7. Water and Sediment Quality. Please respond to Questions 7-14 in Table 1-2.

7.11 Water and Sediment Quality: Brownfield

7.11.1 Baseline Environment

The baseline description provided above covers the wider Marine Scheme region. As ongoing activity associated with oil and gas production alters the water and sediment quality within the Asset 500 m safety zones where the Brownfield Scope will occur, this section reviews the baseline of the receiving environment in these areas.

Oil and gas operations typically involve the permitted discharge of oil from a platform, either via sand disposal, via produced water and/or via open drains[12].

Where sand disposal occurs, most of the free oil will have been removed during washing prior to discharge. While some oil on sand may reach the seabed, currents will disperse the discharge and the sand and associated oil will settle across a wide area (hundreds of meters) rather than in a single location. The volume of oil on sand is not considered sufficient to cause any significant impact on any sediment quality. Based on the relatively low flow speeds in the offshore Marine Scheme region (reaching maximum rates of approximately 0.5 m/s), much of this sand can be assumed to be located within the Asset 500 m safety zones. Within the immediate vicinity of the Assets, sediments exhibit the presence of contaminants considered typical for areas within the vicinity of mature oil production before the prohibition of oil-based muds (OBM) (i.e., Total Hydrocarbon Content (THC) and heavy metals). The level of sediment contamination varies between each Asset and generally increases with proximity to the Asset itself.

During the continued operational life of the Assets, the discharge of critical integrity and process production chemicals (for which no suitable alternatives have been identified) will continue. Where there are discharges of produced water and discharges from open drains, the processes of dilution, evaporation, adsorption/precipitation, biodegradation, and photo-oxidation tend to reduce the concentrations of the discharge in the receiving environment. This decreases their potential toxicity to marine organisms. Studies on the Predicted No Effect Concentrations (PNECs) for the hydrocarbon components most frequently found in produced water have shown that where a 1000-fold dilution is achieved, the PNEC level is reached for these components (OGP, 2002). Crucially, such dilutions are achieved within minutes of the produced water discharge entering the sea. Thus, there is limited risk for marine organisms in the water column to be exposed to harmful doses of these hydrocarbons.

Water quality receptors (as discussed throughout Section 7.5.1) are all located along the coast and are therefore far from the proposed activities which will occur as part of the Brownfield Scope.

[12] *Produced sand is a term used in the oil and gas industry to describe sand which is produced during the oil and gas extraction process; sand is produced as a result of numerous factors, including pressure during extraction, fluid viscosity and the level of consolidation of the geology which has been drilled through. Sand is pumped alongside the recovered oil or gas. Produced water describes water that is produced as a by-product during the extraction and processing of oil and gas. The Offshore Petroleum Activities (Oil Pollution Prevention and Control) Regulations (Amendment) 2011 (OPPC) prohibits the discharge of oil to sea from offshore oil and gas installations other than in accordance with the terms and conditions of a permit. These regulations introduced a permitting system for oil discharges offshore under the Department of Energy and Climate Change (DECC). Thresholds for discharges were also introduced and are as follows: the monthly average concentration of dispersed oil in drainage water must not exceed 40 mg/l. The maximum concentration of dispersed oil must not exceed 100 mg/l at any time.*

7.11.2 Scoping of Impacts

Given the following:

- The distance at which the activity will be occurring from water and sediment quality receptors (inclusive of designated waterbodies, bathing waters, NVZ, wastewater treatments sensitive areas)
- The activity associated with the Brownfield Scope, i.e. temporary installation vessel activity, installation of limited additional infrastructure (cable, cable protection and up to two BLPs) and infrequent short-term vessel activity associated with O&M
- The highly localised area within which the Brownfield Scope will occur
- That the activity will occur within an area of existing infrastructure (established oil and gas assets)
- The heavily modified nature of the receiving environment

it is concluded that no source-pathway-receptor route exists by which activity associated with the Brownfield Scope could appreciably impact on water and sediment quality receptors. While it is acknowledged that there is a degree of contamination within the Asset 500 m zones, this is evidenced to be highly localised (see Section 7.11.1). Evidence from within the Asset 500 m zones indicates that a range of species exist (see Section 7.11.1) suggesting that the extent of contamination is insufficient to affect water and sediment quality and deter biota from inhabiting the area. Though flow speeds are relatively low in the vicinity of the Assets, they are sufficient to dilute the extent of contamination such that there is no anticipated impact on sediments and the water column as a whole. It is therefore proposed that water and sediment receptors can be scoped out of further assessment associated with the Brownfield Scope.

7.11.3 Brownfield Scoping Questions

The Applicant would request responses to the Brownfield scoping questions of relevance to Section 7. Water and Sediment Quality. Please respond to question 5 in Table 1-3.

7.12 References

British Oceanographic Data Centre (BODC) (2020). Clean Seas Environmental Monitoring Programme (CSEMP). Available online at: https://www.bodc.ac.uk/projects/data_management/uk/merman/assessments_and_data_access/csemp/ [Accessed 24/02/2023].

Buchman, M.F., 2008. NOAA Screening Quick Reference Tables. NOAA NOAA OR&R Report 08-1. Seattle WA: NOAA Office of Response and Restoration Division, National Oceanic and Atmospheric Administration.

Centre for Environment, Fisheries and Aquaculture Science (Cefas) (2004). Offshore Wind Farms: Guidance Note for Environmental Impact Assessment in Respect of FEPA and CPA Requirements. Available online at: https://www.cefas.co.uk/publications/files/windfarm-guidance.pdf [Accessed 24/02/2023].

Cefas (2016a). Monthly average non-algal Suspended Particulate Matter concentrations on the UK shelf waters. Available online at: https://www.cefas.co.uk/data-and-publications/dois/monthly-average-non-algal-supended-particulate-matter-concentrations/ [Accessed 24/02/2023].

Cefas (2016b). Suspended Sediment Climatologies around the UK. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/584621/CEFAS_2016_Suspended_Sediment_Climatologies_around_the_UK.pdf [Accessed 24/02/2023].

Cefas (2021). Sediment Management Framework prototype Cefas Action Level tools. Available online at: https://rconnect.cefas.co.uk/action_levels_tool/ [Accessed 24/02/2023].

Centre of Expertise for Water (CREW) (2021). Dynamic Coast 2. Available online at: https://www.crew.ac.uk/dynamic-coast [Accessed 24/02/2023].

Environment Agency (2003). Coastal and marine environmental site guide. Available online at: https://www.gov.uk/flood-and-coastal-erosion-risk-management-research-reports/coastal-and-marine-environmental-site-guide#background [Accessed 24/02/2023].

Gardline (2023a). Greenfield CNSE Environmental Baseline Survey Report. Report Ref. 11823.E04

Gardline (2023b). Greenfield CNSE Habitat Assessment Report. Report Ref. 11823.E03

Long, E.R., MacDonald, D.D., Smith, S.L. & Calder, F.D., 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environmental Management, 19, pp.81-97.

Marine Scotland (2011). Scotland's Marine Atlas: Overall Assessment. Available online at: https://marine.gov.scot/information/scotlands-marine-atlas-overall-assessment-2011 [Accessed 24/02/2023].

OSPAR (2017). OSPAR Intermediate Assessment 2017 – Contaminant assessments. Available online at: https://oap.ospar.org/en/osparassessments/intermediate-assessment-2017/pressures-human-activities/contaminants [Accessed 24/02/2023].

Scottish Environment Protection Agency (SEPA) (2012). Water Body Data Sheets. Available online at: https://www2.sepa.org.uk/WaterBodyDataSheets/ [Accessed 24/02/2023].

SEPA (2014). Land Use Planning System SEPA Guidance Note 17: Marine development and marine aquaculture planning guidance, Version 6. Available online at: https://www.sepa.org.uk/media/143325/lups-gu17-marine-development-and-marine-aquaculture-planning-guidance.pdf [Accessed 24/02/2023].

SEPA (2019). Scotland's water environment 2019: A summary and progress report. Available online at: https://www.sepa.org.uk/media/490771/191219_scotlands-water-environment-final.pdf [Accessed 24/02/2023].

SEPA (2020a). Supporting Guidance (WAT-SG-53) Environmental Quality Standards and Standards for Discharges to Surface Waters. Available online at: https://www.sepa.org.uk/media/152957/wat-sg-53-environmental-quality-standards-for-discharges-to-surface-waters.pdf [Accessed 24/02/2023].

SEPA (2020b). Urban Waste Water Treatment Directive Sensitive Areas Map 2019. Available online at: https://www.gov.scot/binaries/content/documents/govscot/publications/map/2016/01/urban-waste-water-treatment-sensitive-areas-map/documents/urban-waste-water-treatment-sensitive-areas-map-2019/urban-waste-water-treatment-sensitive-areas-map-2019/govscot%3Adocument/UWWTD%2Bdesignations%2B2019.pdf [Accessed 24/02/2023].

SEPA (2022a). Bathing Water Data: 2022. Peterhead (Lido). Available online at: https://www2.sepa.org.uk/BathingWaters/ViewResults.aspx?id=233612 [Accessed 13/03/2023].

SEPA (2022b). Bathing Water Data: 2022. Cruden Bay. Available online at: https://www2.sepa.org.uk/bathingwaters/ViewResults.aspx?id=527186 [Accessed 13/03/2023].

SEPA (2023a). Annual updates on the condition of the water environment. Available online at: https://www.sepa.org.uk/data-visualisation/water-classification-hub [Accessed 24/02/2023].

SEPA (2023b). Water Framework Directive (WFD) River Basin Management Plan (RBMP) Waterbody status. Available online at: https://www.sepa.org.uk/data-visualisation/water-environment-hub/ [Accessed 24/02/2023].

SEPA (2023c). Scotland's Environment data tool for Bathing Waters. Available online at: https://www2.sepa.org.uk/bathingwaters/ [Accessed 24/02/2023].

SEPA (2023d). Nitrates Monitoring. Available online at: https://www.sepa.org.uk/environment/water/monitoring/nitrates-monitoring/ [Accessed on 13/03/2023].

Scottish Government (2015). Nitrate Vulnerable Zones Scotland: Map 4 – Aberdeenshire, Banff, Buchan and Moray. Available online at: https://www.gov.scot/publications/nitrate-vulnerable-zones-maps/ [Accessed on 10/02/2023].

Scottish Government (2023). Nitrate Vulnerable Zones. Available online at: https://www.gov.scot/policies/agriculture-and-the-environment/nvz/ [Accessed on 13/03/2023].

8 BENTHIC ECOLOGY

8.1 Introduction

This section provides an overview of the sensitivities associated with benthic ecology receptors of relevance to the Marine Scheme and considers the potential impacts arising from installation, operation and maintenance and decommissioning phases. Please note, this section only takes into account benthic ecology. As HDD is proposed at the landfall, there is no pathway for impacts within the intertidal region. Potential impacts associated with HDD may occur within the subtidal region and will be assessed within benthic ecology.

This section of the Scoping Report should be read in conjunction with the following sections:

- Section 6 Physical Environment;
- Section 7 Water and Sediment Quality; and
- Section 9 Fish and Shellfish Ecology.

8.2 Legislation, Policy and Guidance

In addition to the relevant policy and legislation described in Section 2, the following section outlines the legislation, policy and guidance that will be taken into consideration in relation to the benthic and intertidal ecology EIA.

8.2.1 National Legislation

UK

- Wildlife and Countryside Act 1981.

Scotland

- Nature Conservation (Scotland) Act 2004; and
- Wildlife and Natural Environment (Scotland) Act 2011.

8.2.2 National Policy

UK

- UK Post 2010 Biodiversity Framework (JNCC) & Department for Environment, Food and Rural Affairs (DEFRA), 2012).

Scotland

- Scotland's Biodiversity: a route map to 2020 (Scottish Government, 2015).

8.2.3 Guidance

- Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2019);
- Assessment of the Environmental Impact of Offshore Wind-Farms (OSPAR, 2008);

- OSPAR Assessment of the Environmental Impacts of Cables (OSPAR, 2009);
- Background document on *Sabellaria spinulosa* reefs (OSPAR, 2013);
- Defining and Managing *Sabellaria spinulosa* Reefs (Gubbay, 2007);
- Identification of the Main Characteristics of Stony Reef Habitats under the Habitats Directive (Irving, 2009);
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (Judd, 2012);
- Refining the criteria for defining areas with a 'low resemblance' to Annex I stony reef (Golding, Albrecht & McBeen, 2020);
- Advances in assessing *Sabellaria spinulosa* reefs for ongoing monitoring (Jenkins, 2018);
- The Status of *Sabellaria spinulosa* Reef off the Moray Firth and Aberdeenshire Coasts and Guidance for Conservation of the Species off the Scottish East Coast (Pearce and Kimber, 2020); and
- Priority Marine Features (PMFs), as described in NatureScot Commissioned Report 388; Strategy.

8.3 Study Area

The benthic ecology Study Area is defined as where the Marine Scheme directly interacts with the seabed. Where appropriate, a larger impact area will be considered, for example when considering the potential for increased SSC; this is based on the Study Area for the physical environment (Section 6.3; Figure 6-1). This applies a 10 km buffer to the Marine Scheme from MHWS to 65 km offshore and a 5 km buffer applied from 65 km offshore to the OCS and Assets.

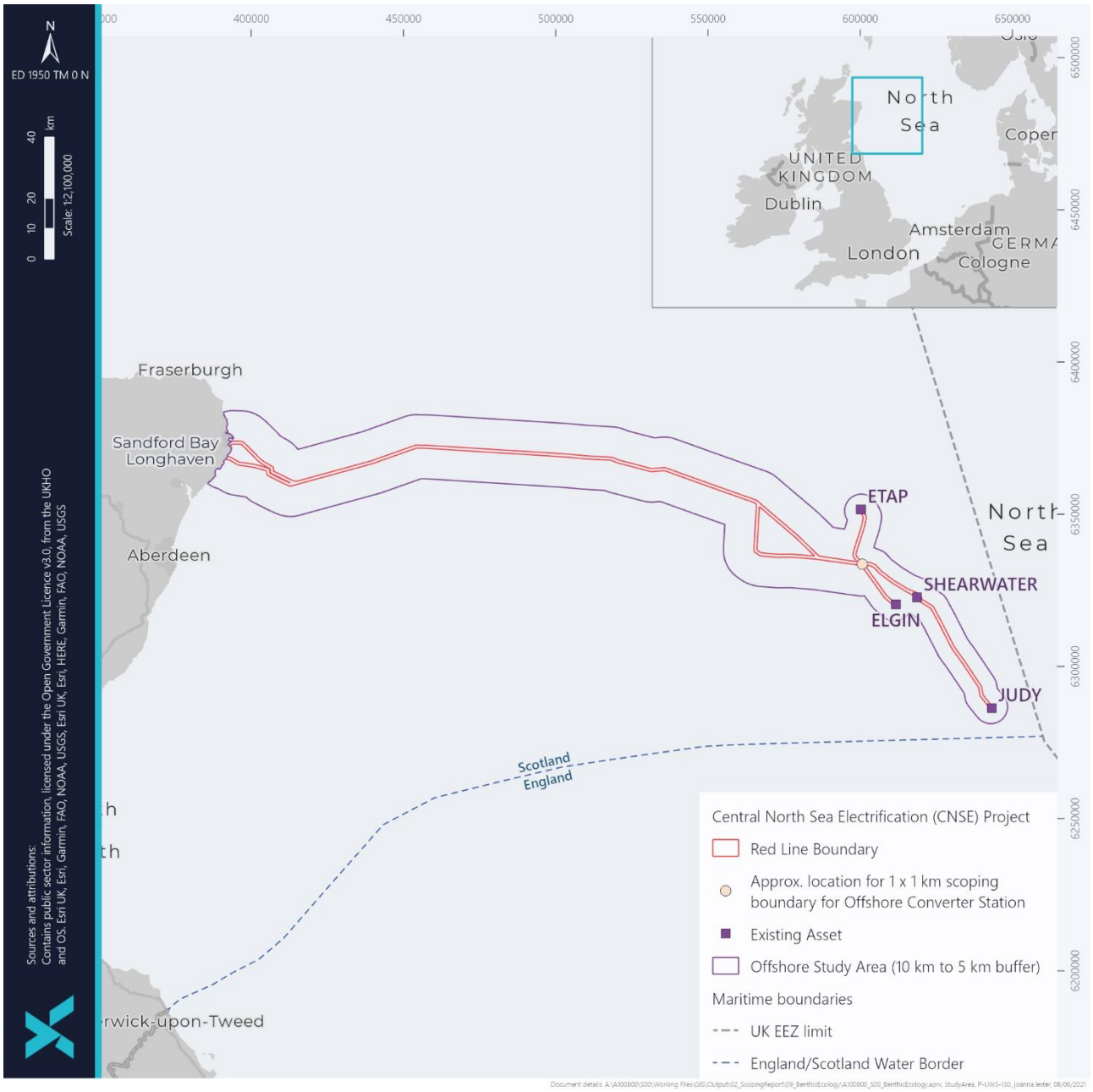

Figure 8-1 Benthic ecology Study Area

8.4 Key Data Sources

The existing data sets and literature with relevant coverage to the Marine Scheme which have been used to inform this Scoping Report and are proposed to inform the baseline characterisation for the EIA are outlined in Table 8-1.

Table 8-1 Data sources for the benthic ecology assessment

Name of Source	Description/ Link	Author	Date
List of threatened and/or declining species and habitats	https://www.ospar.org/work-areas/bdc/species-habitats/list-of-threatened-declining-species-habitats	OSPAR	2008
Scottish priority marine features (PMF)	https://marine.gov.scot/sma/content/descriptions-scottish-priority-marine-features-pmfs	Tyler-Walters *et al.*	2016
SAC Scotland ESRI	https://www.nature.scot/professional-advice/protected-areas-and-species/protected-areas/international-designations/european-sites/special-areas-conservation-sacs	NatureScot	2020
SSSI Scotland ESRI	https://data.gov.uk/dataset/d64bf689-4ce8-465b-b00e-6a57dec94a22/site-of-special-scientific-interest-scotland	NatureScot	2020
SPA Scotland ESRI	https://data.gov.uk/dataset/549cfe11-819d-4b0c-9479-9c70135fe9cf/special-protection-area-scotland	NatureScot	2020
MPA Scotland ESRI	https://marine.gov.scot/maps/844	NatureScot	2020
UK Protected Area Datasets for Download	https://jncc.gov.uk/our-work/uk-protected-area-datasets-for-download	JNCC	2018
Annex I Reefs in UK offshore waters (public)	https://hub.jncc.gov.uk/assets/992dfef7-3267-43db-b351-5927bf0621d4	JNCC	2021
Annex I Submarine structures made by leaking gas	https://hub.jncc.gov.uk/assets/b47ebc16-7b74-4a69-bd4b-7e29c0584d59	JNCC	2016
Spatial data relating to benthic ecology on National Marine Plan Interactive	https://marinescotland.atkinsgeospatial.com/nmpi/	NMPi	2020
EU Sea Map	https://emodnet.ec.europa.eu/en/euseamap-2021-emodnet-broad-scale-seabed-habitat-map-europe	EMODnet	2021
Feature Activity Sensitivity Tool	http://www.marine.scotland.gov.uk/FEAST/	Marine Scotland	2013
Species distribution modelling of marine benthos: A North Sea case study	https://www.researchgate.net/publication/236647105_Species_distribution_modelling_of_marine_benthos_A_North_Sea_case_study	Reiss *et al.*	2011
Surveys from nearby developments (to	There is a considerable amount of available existing environmental survey data from across the Marine	Various	Various

Name of Source	Description/ Link	Author	Date
inform the Brownfield Scope assessment)	Scheme area which has been built over the years by the operators of the four Assets (Section 8.11.1)		

In addition to the key data sources listed above, the EIA will be supported by site-specific benthic surveys covering the Marine Scheme area. Initial surveys were undertaken in 2022 (Gardline, 2023). Additional survey coverage will be achieved during the 2023 survey campaign, which aims to fill in data gaps from the initial survey effort. The broad scope for the 2023 benthic survey includes:

- Grab samples for Particle Size analysis (PSA) as well as macrofauna and contaminant analysis;
- Acquiring seabed imagery using Drop-Down Video (DDV) and/or a towed camera to inform a Habitat Assessment.

The geophysical survey includes multibeam echosounder (providing backscatter and side scan data) and sub-bottom profiler, as well as nearshore and shallow bathymetric mapping. The inputs from site-specific surveys will contribute to the baseline understanding for benthic ecology, as appropriate.

8.5 Baseline Environment

8.5.1 EUNIS Habitats

The predicted European Union Nature Information System (EUNIS) habitat classification within the majority of the Marine Scheme are dominated by EUNIS habitat A5:27 Deep circalittoral sand. This was also confirmed by the site-specific survey conducted in 2022 (Gardline, 2023). Within the wider benthic ecology Study Area, there are smaller patches of A5:15: Deep circalittoral coarse sediment and A5.35: Circalittoral sandy mud (Figure 8-2). Within the wider benthic ecology Study Area, there is a patch of A5.25 or A5.26 Circalittoral fine sand or circalittoral muddy sand to the south of the Marine Scheme, and small patches of A4.27 Faunal communities on deep moderate energy circalittoral rock, A4.2 Atlantic and Mediterranean moderate energy circalittoral rock, A4.1. Atlantic and Mediterranean high energy circalittoral rock and A3.1. Atlantic and Mediterranean high energy infralittoral rock (Figure 8-2). The predicted EUNIS habitat classification within the intertidal section of the Marine Scheme are dominated by A5.15 Deep circalittoral coarse sediment and landfall A5.14: Circalittoral coarse sediment.

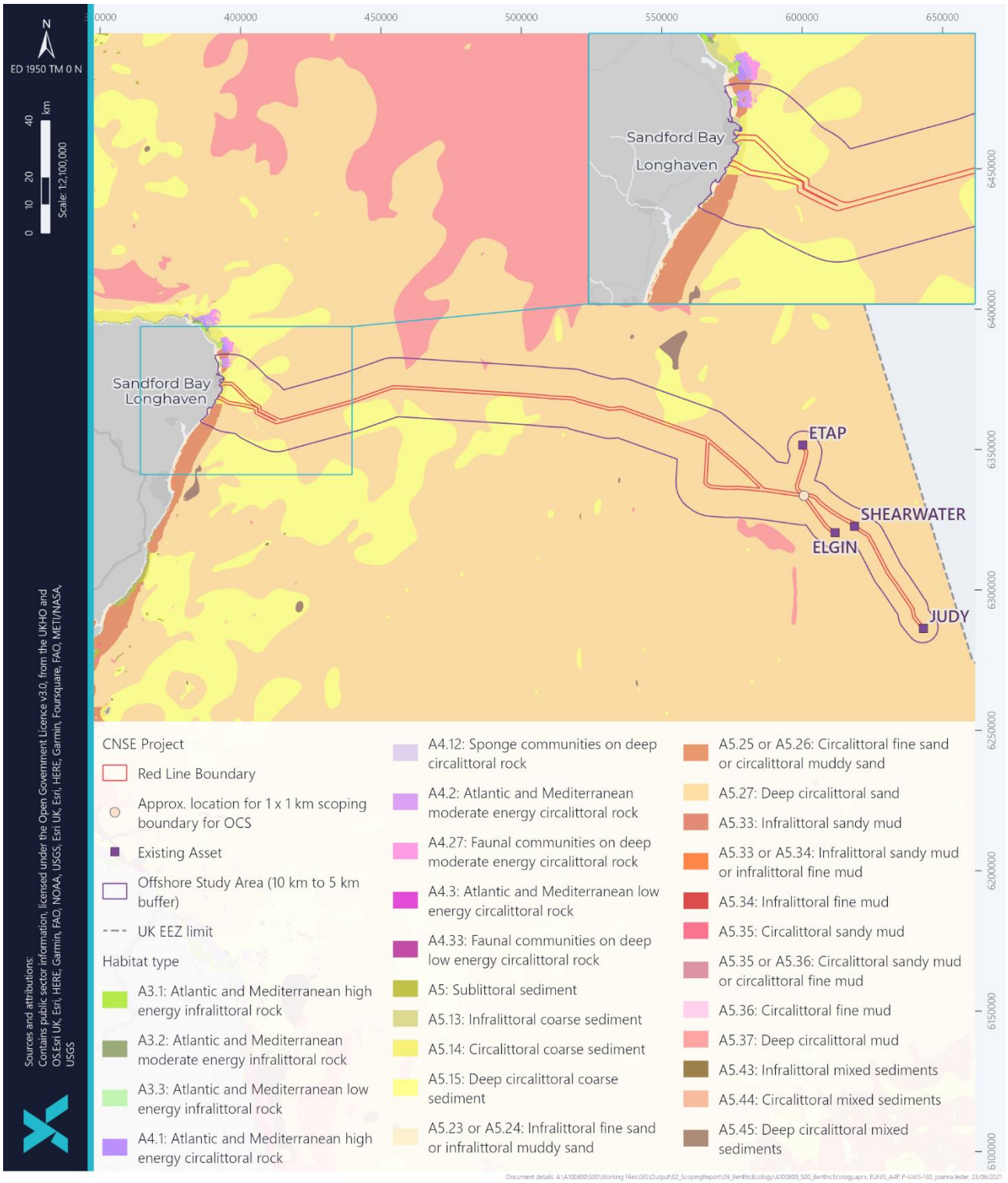

Figure 8-2 EUNIS habitats within the benthic ecology Study Area

8.5.2 Annex I Habitats

Throughout the UK, there are three Annex I marine habitats that occur regularly (EU Commission, 2013). These are:

- Reefs (defined as hard substrate on the sea floor which can be formed in several difference ways);
- Sandbanks (with a degree of seawater cover at all times); and
- Submarine structures made by leaking gases (e.g. Methane Derived Authigenic Carbonate (MDAC)).

Out of the three Annex I habitats, two habitats are potentially present within the benthic ecology Study Area: potential reef habitat in nearshore region to the north of the Marine Scheme, and two small areas of potential pockmarks located to the north and south of the Marine Scheme which are indicative of potential MDAC (Figure 8-3).

Biogenic reef forming *Sabellaria spinulosa* is known to occur off the Aberdeenshire coast, and therefore, there is potential for this habitat to be present within the Marine Scheme (Pearce and Kimber, 2020). There is also potential Annex I habitats stony or biogenic reef in the near shore area associated with the course sediment habitat shown in (MMT, 2013).

Figure 8-3 Annex I habitats within the benthic ecology Study Area

8.5.3 Designated Sites and Associated Species

The Marine Scheme will directly interact with the Bullers of Buchan Coast Site of Special Scientific Interest (SSSI), Buchan Ness to Collieston SAC, and East of Gannet and Montrose Fields NCMPA. However, only the following two sites are designated for marine features which are relevant to benthic ecology:

- Bullers of Buchan Coast Site of Special Scientific Interest (SSSI) overlaps with the southern landfall. The Bullers of Buchan Coast SSSI is designated for Coastal Geomorphology of Scotland and Guillemot (*Uria aalge*), breeding (NatureScot, 2023a); and
- East of Gannet and Montrose Fields NCMPA overlaps with the Marine Scheme. The East of Gannet and Montrose Fields NCMPA is designated for offshore deep sea muds and ocean quahog aggregations (including the supporting sands and gravels habitat) (JNCC, 2023a).

In addition, there are three designated sites (Figure 8-4) located within the benthic ecology Study Area including:

- The Southern Trench NCMPA located approximately 0.4 km north of the Marine Scheme. The Southern Trench NCMPA is designated for the protection of biodiversity (minke whale, burrowed mud, fronts, shelf deeps) and geodiversity features (Quaternary of Scotland, Submarine Mass Movement) (NatureScot, 2023a)); and
- Turbot Bank NCMPA located approximately 1.2 km south of the Marine Scheme. The Turbot Bank NCMPA is designated for the protection of mobile species (sandeels) (JNCC, 2023b).

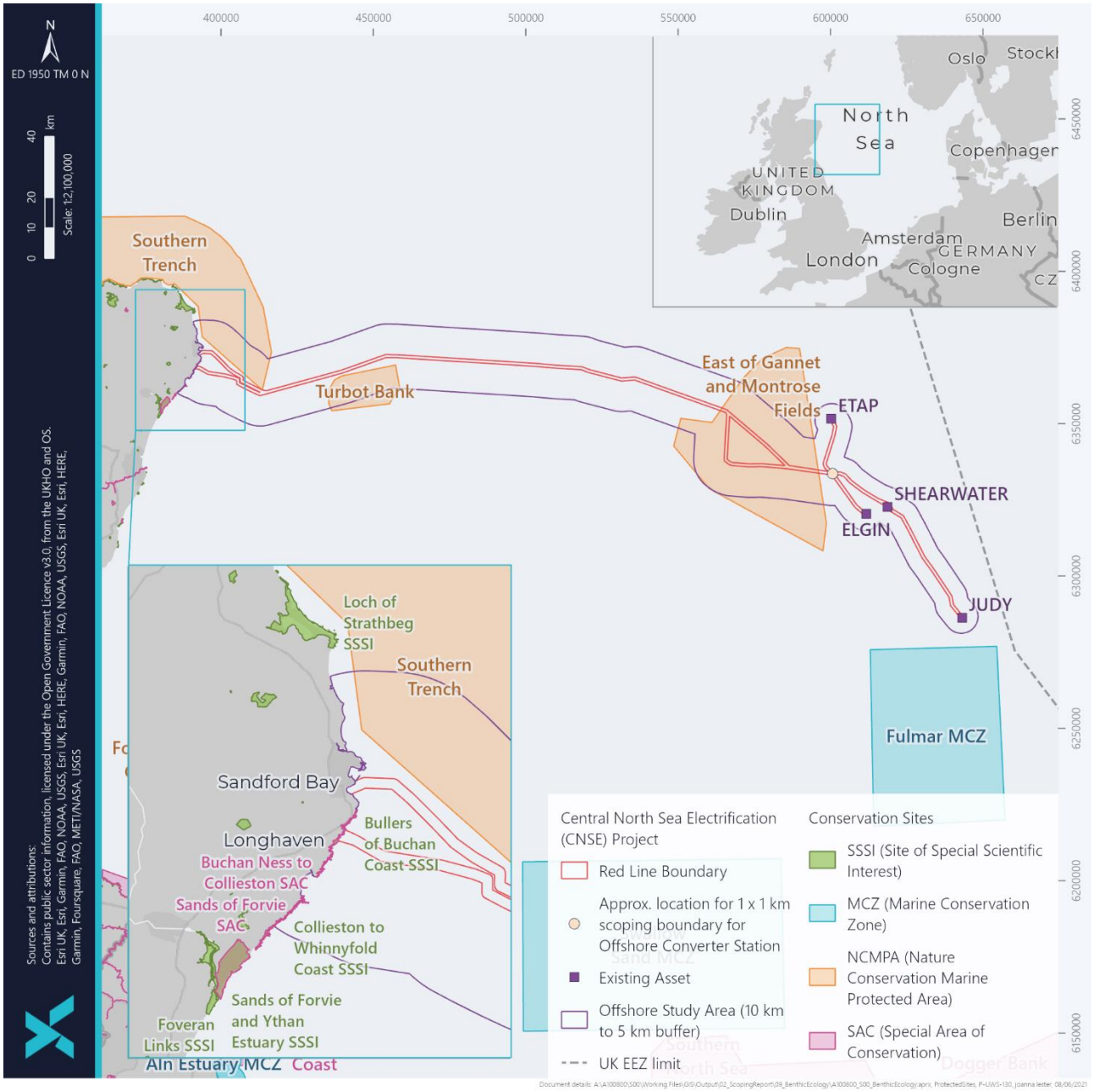

Figure 8-4 Designated sites within the benthic ecology Study Area

8.5.4 Priority Marine Features

The Scottish Government identified a list of 81 priority marine features (PMFs) that were considered to be characteristic of the Scottish marine environment in 2014 (NatureScot, 2020). While most of these PMFs are protected under existing MPA designations, 11 PMFs have been identified as the most vulnerable within Scottish inshore waters. These are:

- Cold water coral reefs (*Lophelia pertusa*);
- Fan mussel (*Atrina fragilis*) aggregations;
- Blue mussel (*Mytilus edulis*) beds;
- Horse mussel (*Modiolus modiolus*) beds;
- Flame shell (*Limaria hians*) beds;
- Maerl beds (Phymatolithon calcareum);
- Maerl or coarse shell gravel with burrowing sea cucumbers (*Neopentadactyla mixta*);
- Native oysters (*Ostrea edulis*);
- Northern sea fan (*Swiftia pallida*) and sponge communities;
- Seagrass beds; and
- Serpulid aggregations.

PMFs listed to be in Scottish offshore waters include:

- Burrowed mud;
- Carbonate mound communities;
- Cold-water coral reefs;
- Coral gardens;
- Deep sea sponge aggregations;
- Offshore deep sea muds;
- Offshore subtidal sands and gravels;
- Seamount communities; and
- Submarine structures made by leaking gases.

The Marine Scheme overlaps with East of Gannet and Montrose Fields NCMPA, this NCMPA is designated for PMFs offshore deep sea mud and offshore sands and gravels (also protected under UK Biodiversity Action Plan (UKBAP)) as well as ocean quahog as a low or limited mobility species. These are protected under existing NCMPA designations (JNCC, 2014). Ocean quahog are also listed as an OSPAR threatened and/or declining species (OSPAR, 2008).

Out of the PMFs listed above, the PMFs likely to be present within the benthic ecology Study Area include blue mussel, flame shell and burrowed mud.

8.5.5 Habitats Supporting Blue Carbon Storage

Blue carbon refers to a marine or coastal environment and its potential to capture and store carbon dioxide (CO_2). Plants and calcifying organisms have the potential to capture and store carbon in both the long and short term. The principal threats to the long-term storage of carbon within a marine or coastal environment result from any process or activity that disturbs the top layers of sediment (such as the placement of subsea cables and pipelines). The key habitats that support blue carbon storage and sequestration include:

- Kelp forests;
- Intertidal macroalgae;
- Subcanopy algae;
- Maerl beds;
- Seagrass beds;
- Horse mussels (*Modiolus modiolus*);
- Flame shell (*Limaria hians*);
- *Desmophyllum pertusum* beds;
- Tubeworm (Serpula vermicularis) reef;
- Brittlestar (*Ophiuroidea*) beds;
- Blue mussel (*Mytilus edulis*); and
- Burrowed mud.

Activities associated with the installation of subsea cables has the potential to disturb the long-term storage of carbon in rocks and sediments throughout the Marine Scheme. An assessment of blue carbon storage and the potential impacts of the Marine Scheme on associated habitats considers the following:

- Uncertainty surrounding the levels of carbon storage across the Marine Scheme and a lack of information relating to the levels of blue carbon storages within sediments associated with the Marine Scheme;
- The relatively small footprint of the Marine Scheme disturbing potential blue carbon habitats and the local scale of any potential impacts associated with the Marine Scheme which will result in limited potential for the release of carbon stored in sediments;
- Uncertainty at this stage of the development of the detailed design of the Marine Scheme including the location of the offshore cables and installation methods which may result in disturbance to carbon storage in benthic and subtidal habitats during the installation of the Marine Scheme; and
- The non-significant effects of SSC and associated deposition will not extend outside the defined benthic ecology Study Area (as assessed in Section 6 Physical Environment).

As no benthic sediments across the Marine Scheme have been identified which are of particular importance for blue carbon storage, and given the relatively small footprint of the Marine Scheme, the potential for significant impacts to blue carbon storage have been scoped out of further assessment.

8.6 Embedded Mitigation

At this stage topic-specific measures have not been developed; however, certain measures have been proposed as part of the development process in line with industry best-practice to reduce the potential for impacts to benthic ecology (Table 8-2). The embedded mitigation specific to benthic ecology receptors will be agreed upon by the Applicant and will be detailed within the EIAR. Unless otherwise indicated, the mitigation measures will be secured through the ML consent conditions.

Table 8-2 Proposed embedded mitigation measures

Embedded Mitigation	Primary/ Tertiary
Develop and implement a CEMP, including a Marine Pollution Contingency and Control Plan, and an Invasive Non-Native Species (INNS) management plan.	Tertiary
Micro-routeing within the Marine Scheme will be carried out to help avoid or minimise interactions with localised engineering and environmental constraints (including avoidance of any identified seabed heritage assets and other features of archaeological significance). This decision making will be informed by CBRA.	Primary
Utilisation of HDD to avoid direct intertidal impacts	Primary
Placement of scour protection for the OCS will be minimised as far as possible (supported by a scour assessment).	Primary

8.7 Scoping of Impacts

Potential impacts have been identified and considered based on professional experience, the PDE, relevant third-party environmental reports (as summarised in Section 8.4) and the understanding of the benthic ecology baseline. The potential impacts for benthic ecology receptors are summarised in Table 8-3.

Table 8-3 Scoping of potential impacts relating to benthic ecology receptors

Potential Impact	Scoping Result	Justification	Information Required to Inform the Assessment	Assessment Method
Installation and Decommissioning				
Temporary benthic habitat / species loss or disturbance	Scoped in	There is the potential for the temporary loss or disturbance to benthic subtidal Annex I habitats as a result of activities during the installation and decommissioning phases of the Marine Scheme.	Benthic subtidal ecology surveys will be undertaken to collect site-specific data and to identify the location and/or extent of Annex I habitats present within the benthic ecology Study Area.	No specific modelling is required, instead the area of impact will be assessed through the seabed footprint associated with the PDE. CIEEM (2022) guidance for ecological impact assessments will be followed.
Increased SSC and associated deposition (including mobilisation of potential contaminants)	Scoped in	Sediment disturbance as a result of installation and decommissioning activities may result in indirect impacts on benthic ecology as a result of increases in SSC through pathways including reduced water clarity (due to increased SSC) and potential smothering due to sediment deposition.	Benthic ecology surveys will be undertaken to collect site-specific data and to identify the location and/or extent of benthic habitats present within the benthic ecology Study Area.	The primary productivity and the corresponding effects of the potential impact will be considered and habitat maps will be produced as part of the benthic ecology technical report. The assessment regarding the potential for mobilisation of potential contaminants will be conducted in line with Cefas Action Level guidelines. No numerical modelling is proposed for the assessment.
Increased risk of introduction of INNS	Scoped out	The movement of vessels during the installation and decommissioning phases of the Marine Scheme have the potential to result in the introduction of INNS. A CEMP (including an INNS Management Plan) and adherence to relevant legislation and guidance will ensure that all required mitigation measures are in place so that the potential for the introduction of INNS are minimised. Through these measures the discharges of ballast waters and biofouling of vessels will be controlled. For these reasons, it is considered that there is no potential pathway for significant impacts resulting from the installation (or decommissioning) of the Marine Scheme. The potential impact is therefore scoped out.		
Accidental release of pollutants	Scoped out	The accidental release of pollutants is limited to diesel and chemicals associated with any Marine Scheme vessels. In the unlikely event of a release of contaminants as a result of installation and decommissioning works, any impacts are anticipated to be highly localised and temporary. Designed in measures, such as a CEMP including Marine Pollution Contingency Plans and adherence to MARPOL, will ensure that measures are adopted to ensure that the potential for accidental release of contaminants is minimised. The potential impact is therefore scoped out.		
Operation and Maintenance				
Permanent benthic habitat / species loss or disturbance, and permanent change/alteration to substrata and habitats.	Scoped in	There is the potential for the permanent loss or disturbance to habitats. Rock protection and the introduction of hard substrate (rock) has the potential to change / alter the seabed and supporting habitats. This could subsequently impact the structure, function and extent of a feature.	Benthic ecology surveys will be undertaken to collect site-specific data and to identify the location and/or extent of benthic habitats present within the benthic ecology Study Area.	No specific modelling is required, instead a qualitative assessment will be undertaken and presented within the EIAR.
Increased SSC and associated deposition	Scoped in	Sediment disturbance arising from operation and maintenance activities has the potential to result in direct and/or indirect impacts on benthic habitats and communities as a result of increased sediment disturbance and associated deposition. This would occur where there is maintenance required on a cable to fix a fault or damage, or where a cable has become exposed and requires re-burial. These are not considered to be regular / routine activities and would be undertaken only as and when required in the event of damage.	Benthic ecology surveys will be undertaken to collect site-specific data and to identify the location and/or extent of benthic habitats present within the benthic ecology Study Area.	The primary productivity and the corresponding effects of the potential impact will be considered, and habitat maps will be produced as part of the benthic ecology technical report. The assessment of increased SSC and associated deposition will be conducted in line with Cefas Action Level guidelines.

Potential Impact	Scoping Result	Justification	Information Required to Inform the Assessment	Assessment Method
				No numerical modelling is proposed for the assessment.
Colonisation of hard structures	Scoped in	Cable protection placed on the seabed is expected to be colonised by a variety of marine organisms which has the potential to lead to localised changes in biodiversity.	Benthic ecology surveys will be undertaken to collect site-specific data and to identify the location and/or extent of benthic habitats present within the benthic ecology Study Area.	No specific modelling is required, instead a qualitative assessment will be undertaken and presented within the EIAR.
Changes in physical processes from cable protection measures	Scoped in	The presence of cable protection has the potential to induce localised changes to tidal flow and wave climate, resulting in potential changes to sediment transport regime and associated effects on benthic habitats and communities (Section 6).	Benthic ecology surveys will be undertaken to collect site-specific data and to identify the location and/or extent of benthic habitats present within the benthic ecology Study Area.	The primary productivity and the corresponding effects of the potential impact will be considered, and habitat maps will be produced as part of the benthic ecology technical report. No numerical modelling is proposed for the assessment.
Impacts to benthic communities as a result of thermal load or electromagnetic field (EMF) arising from the cable during operation	Scoped out	Subsea cables emit EMFs, with high-voltage AC or DC cables emitting the greatest EMFs. There is the potential for thermal load and/or EMF during operation to impact benthic species. The level of exposure to EMF or thermal load will be dependent on the type of cable burial and protection measures adopted. Several studies have investigated the impacts of EMFs on benthic organisms, including crustaceans and molluscs. Tank-based experiments using simulated EMF investigated the impacts on several benthic invertebrate species common in the northeast Atlantic. There is no evidence for biological effects from EMF of the magnitude that would be associated with Marine Scheme cables. For these reasons, it is considered that there is no potential pathway for significant impacts resulting from the operation and maintenance of the Marine Scheme. The potential impact is therefore scoped out. Further justification for scoping this impact out is presented in Section 8.7.1.		
Accidental release of pollutants	Scoped out	The accidental release of pollutants is largely limited to oil and fluid emissions associated with any vessels. The potential release of contaminants as a result of operation and maintenance works are anticipated to be highly localised and temporary. Designed in measures, such as a CEMP including Marine Pollution Contingency Plans and adherence to MARPOL, will ensure that measures are adopted to ensure that the potential for accidental release of contaminants is minimised. With respect to the OCS, it will be normally unmanned throughout the operation and maintenance phase of the Marine Scheme. Therefore, the opportunity for accidental discharges from the OCS during this time is extremely limited. For these reasons, it is considered that there is no potential pathway for significant impacts resulting from the operation and maintenance of the Marine Scheme. The potential impact is therefore scoped out.		
Introduction and spread of INNS	Scoped out	The movement of vessels during the operation and maintenance phases of the Marine Scheme have the potential to result in the introduction of INNS. A CEMP (such as an INNS Management Plan) and adherence to relevant legislation and guidance will ensure that all required mitigation measures are in place so that the potential for the introduction of INNS are minimised. Through these measures the discharges of ballast waters and biofouling of Marine Scheme vessels will be controlled. For these reasons, it is considered that there is no potential pathway for significant impacts resulting from the operation and maintenance of the Marine Scheme. The potential impact is therefore scoped out.		

8.7.1 Scoping Assessment Justification

8.7.1.1 Impacts to benthic communities as a result of thermal load or electromagnetic field (EMF) arising from the cable during operation

The HVDC Cables will have a capacity of up to 220 MW (0.22GW) and where possible will be buried in the seabed to a depth of 1.5 m. The HVDC Cables will be installed in a bundled design. The EMF emissions from HVDC Cables are much lower when bundled together. A recent modelling study demonstrated that two 550 kV HVDC Cables (2000A; 1 GW) buried at 1 m depth, produce a maximum magnetic field of 2.22 µT at 5 m above the seabed if they are bundled together, and the combined EMF and natural geomagnetic field levels are modelled to fall to within background geomagnetic levels within 10 m of the bundled cables (Scotland England Green Link 1, 2022). This suggests that the effects of EMF from the lower-capacity HVDC Cables will be restricted to the immediate (<10 m) vicinity of the bundled cables.

Several studies have investigated the impacts of EMFs on benthic organisms, including crustaceans and molluscs. While there is limited evidence of physiological and behavioural effects of EMF on marine benthic species, there is no evidence of any impacts from field studies, or from laboratory experiments which utilised levels of EMF likely to be associated with EMF emissions from infrastructure associated with the Marine Scheme.

Tank-based experiments using simulated EMF investigated the impacts on several benthic invertebrate species common in the northeast Atlantic. For example, effects of EMF have been observed in brown crab *Cancer pagarus* where physiological stress was detected when exposed to EMF of between 500 µT – 40,000 µT (Scott *et al.*, 2021) and the cockle *Cerastoderma glaucum*, where impacts on physiological parameters like filtration rate and ammonia excretion were observed when organisms were exposed to EMF up to 64,000 µT (Jakubowska *et al.*, 2022).

However, the B- (magnetic) fields used for these studies are several orders of magnitude higher than would be expected from a subsea cable for an offshore development. As an example, an electric current of 1600 A (common in submarine cables) could generate a B-field of 3 200 µT directly at the surface of the cable, but this declines to ~320 µT at 1 m distance from the surface of the cable (Taormina 2018). As the burial of cables in the sediment reduces the potential for marine benthic species to be exposed to high strength magnetic fields and given the target burial depth of HVDC Cables, this represents a realistic level of EMF emissions from the Marine Scheme, and there is no evidence for biological effects from EMF of this magnitude.

A range of experiments have examined behavioural and physiological effects of EMF on benthic marine species, including brown shrimp *Crangon crangon*, Harris mud crab *Rhithropanopeus harrisii,* and blue mussel *Mytilus edulis* (up to 3,700 µT; Brochert et Zettler 2004), and crustaceans such as red rock crab, yellow rock crab and Dungeness crab (Love *et al.*, 2017). None of these studies found any measurable effects of EMF exposure on these species. While Aristharkhov *et al.* (1988) found a decrease of hydration in blue mussels exposed to 5,800 – 80,000 µT EMF, another study exposed blue mussels to 300,000 µT and found that they did not exhibit any observable differences in valve activity and filtration rate, thus suggesting that artificial B-fields do not significantly impair their feeding behaviour (Luana *et al.*, 2022). The burrowing activity of *H. diversicolor* (a polychaete) was enhanced when treated with EMF up to 1,000 µT, however no avoidance or attraction behaviour to EMF was shown (Jakubowska *et al.*, 2019). Note that in all these studies, the levels of B-field were greater (in many cases, orders of magnitude greater) than those that could be expected in association with a typical subsea cable.

Due to the lack of evidence of plausible effects of EMF on benthic organisms, impacts of EMF on benthic ecology have therefore been scoped out of the EIA[13].

8.8 Potential Cumulative and Transboundary Impacts

Although the predicted impacts of the Marine Scheme are anticipated to be localised, there is the possibility that certain impacts from the Marine Scheme may interact with other projects, plans and activities, which could result in a cumulative effect on benthic ecology receptors. There is the potential for cumulative offshore benthic ecology impacts to occur during the installation phase of the Marine Scheme. The projects to be considered as part of the Cumulative Impact Assessment are summarised in Table 4-3. The assessment will be made based on information in the public domain, and in line with the methodology outlined in Section 4.

There is no potential for transboundary impacts on benthic ecology receptors to arise as a result of installation, operation and maintenance or decommissioning activities associated with the Marine Scheme. Any potential impacts associated with the Marine Scheme will be highly localised. Potential transboundary impacts on benthic ecology receptors are therefore proposed to be scoped out of the EIA and will not be assessed further within the EIAR.

8.9 Proposed EIA Methodology

A desk-based study will be undertaken to review and summarise the potential impacts of the Marine Scheme on benthic ecology receptors. This assessment will include an overview of the key environmental receptors associated with the Marine Scheme and will outline the appropriate mitigation measures that will be adopted where potential impacts to sensitive receptors are predicted to be significant. Consultation with key stakeholders will be undertaken prior to the submission of the EIAR. The following consultees will be considered for the Marine Scheme:

- MD-LOT;
- NatureScot;
- Scottish Wildlife Trust; and
- JNCC.

Benthic ecology surveys have been undertaken to collect site-specific data for environmental baseline characterisation. Data gathered during the surveys will provide a detailed description of the benthic environment and biotope classification and will identify the presence or absence of species or habitats of conservation importance.

The assessment of potential impacts of the Marine Scheme on benthic ecology will be consistent with the approach recommended by CIEEM (2022). Any potential direct and indirect impacts of the Marine Scheme will be assessed, and the sensitivity, vulnerability and recoverability of benthic ecology receptors will be assessed using the Scottish Government's Feature Activity Sensitivity Tool (FEAST) and the Marine Life Information network (MarLIN, 2022). The assessment of impacts will be conducted in line with the overall EIA methodology described in Section 4 and will be in accordance with the relevant legislation, policy, and standard industry and best-practice guidance.

[13] *The conclusions reached for HVDC are also considered applicable for magnetic fields associated with HVAC, evidence indicating that the influence of cable magnetic field declines to zero within 10 metres of an AC cable at the seabed (Normandeau et al., 2011)*

8.10 Scoping Questions

The Applicant would request responses to the Greenfield scoping questions of relevance to Section 8. Benthic Ecology. Please respond to Questions 7-14 in Table 1-2.

8.11 Benthic Ecology: Brownfield

8.11.1 Environmental Baseline

The baseline description provided above covers the wider region. As ongoing anthropogenic activity alters benthic ecology within the Asset 500 m safety zones where the Brownfield Scope will occur, this section reviews the baseline of the receiving environment in these areas. The following characterisation of the benthic environment within the Asset 500 m zones has been informed by existing Asset survey data, including:

- Environmental Monitoring Survey Shearwater Platform UKCS 22/30b (Fugro, 2011);
- Environmental Monitoring Survey Shearwater UKCS Block 22/30b (Fugro, 2013);
- Habitat Assessment Report Shearwater UKCS Block 22/30a (Fugro, 2019a);
- Environmental Monitoring Survey and Habitat Assessment Report Shearwater Field UKCS Block 22/30b (Fugro, 2019b);
- Talbot Site and Route Survey UKCS Blocks 30/7, 30/2 and 30/13. Habitat Assessment Report (Gardline, 2019a);
- Dunnottar Site Survey UKCS Block 30/8. Habitat Assessment Report (Gardline, 2019b)[14];
- UKCS 30/7 Jade South RWL Site Survey: Seafloor and HR Seismic Hazard Survey (Gardline, 2019c);
- ETAP Electrification Concept Development Summary Reporting of Environmental Baseline/Monitoring Data (bp, 2023a);
- Shearwater Environmental Assessment Justification (Shell, 2021);
- J Area Environmental Description (Harbour Energy, 2023);
- Marnock ETAP PDR MAT Environmental Justification Document (bp, 2023b); and
- Elgin Production Operations Environmental Assessment Justification Document (TotalEnergies, 2022).

The EIA will utilise the sources as listed in Section 8.4 to describe the areas within which the Brownfield Scope will occur. In addition, site-specific benthic surveys of the Marine Scheme area will supplement the understanding of the area (with samples taken as close to the Asset 500 m safety zones as safely practicable).

According to the BGS derived Folk classification of sediments across the whole Marine Scheme area is either classed as mud to muddy sand or sand. The ETAP and Judy Assets are, respectively, the most northerly and southerly of the participating Assets. These Assets and their surroundings are located within areas of sandy seabed. Conversely, the Elgin and Shearwater Assets are located within an area classified as mud to muddy sandy. The macrofaunal communities associated with these Assets are fitting per the sediment type. Site-specific surveys of the Assets and the fields with which they are associated consistently describe benthic communities which are representative and typical of the wider CNS. The heterogeneity of these communities varied somewhat according to the sediment type and degree of physical disturbance. In some cases, a relatively high abundance of polychaetes suggests the presence

[14] *Please note, the Dunnottar and Talbot surveys occurred in the vicinity of the Judy Asset and so have been used to characterise the area near Judy. Additionally, the Jade field is part of the J-area group of assets which includes the Judy Asset.*

of disturbed sediments, as this often results in a shift in benthic community structure towards higher numbers of certain opportunistic species. Across the Assets, survey findings suggest that the characterisation of the communities was either consistent with conditions expected of relatively unpolluted areas or indicated dominance by species which are considered to be highly tolerant of hydrocarbon pollution.

The sediments in the immediate vicinity of the Assets exhibit levels of contamination (Total Hydrocarbon Content (THC) and heavy metals) typical for areas in the vicinity of mature oil production where activity occurred before the prohibition of oil-based muds (OBM) discharges. The level of contamination varies between the four Assets, although generally increases with proximity to the Asset itself.

Over the continued operational life of the Assets, the discharge of critical integrity and process production chemicals for which no suitable alternatives have been identified will continue. Production chemicals will temporarily add to localised background levels of chemicals in the immediate vicinity of the platform. The benthic communities identified during surveys (as above) indicate that levels of contamination do not significantly impact or deter local species. Beyond general operational contamination, in the wake of an incident, discharge to sea of OBM and the presence of microbial mats on the seabed within an Asset 500 m zone only resulted in discernible effects on benthic fauna within 1 km of the Asset. This suggests that generally, the extent of contamination is limited to the immediate Asset location. The implications of the Brownfield Scope on Water and Sediment Quality is discussed in full in Section 7.11.

With regards to species and habitats of conservation interest, surveys at the Assets located in muddier sediments reported some observations of sea pens. None of these observations were accompanied by burrows at sufficient densities to suggest that the habitat 'Sea pens and burrowing megafauna' was present. Ocean quahog were variably recorded across the four Assets. In some areas, they were found to be highly abundant within Asset 500 m zones. Their presence in these highly modified environments suggests limited long-term faunal change beyond the 500 m safety zone. In areas north of the ETAP Asset, Methane Derived Authigenic Carbonates (MDAC) was observed by SSS effort. However, the presence of MDAC has not been confirmed by sampling effort at ETAP and associated assets. Furthermore, no MDAC is associated with the Brownfield Scope of the Marine Scheme. No other species or habitats of conservation interest were identified by surveys around the Assets.

8.11.2 Scoping of Impacts

Given activity associated with the Brownfield Scope will interact directly with the seabed within the 500 m safety zone, benthic ecology within this area will be affected by the Marine Scheme. It is noted that the relative area potentially impacted is limited to less than 4 x 500 m safety zones i.e. less than 0.2% of the area occupied by the Greenfield Scope. The following represent potential impact pathways:

- Seabed preparation (detailed in Section 3.4);
- Cable and BLP installation (Section 3.7);
- Installation of cable protection and BLP scour protection measures (detailed in Section 3.5.2 and Section 3.7); and
- O&M (detailed in Section 3.8).

Consequently, potential impacts are considered in the following table.

Table 8-4 Scoping of potential impacts relating to benthic ecology receptor within the context of the Brownfield Scope

Potential Impact	Scoping Result	Justification	Information Required to Inform the Assessment	Assessment Method
Installation and Decommissioning				
Temporary benthic habitat / species loss or disturbance	Scoped in	There is the potential for the temporary loss or disturbance to benthic habitats and species as a result of activities during the installation and decommissioning phases of the Marine Scheme.	Benthic subtidal ecology surveys for the Greenfield Scope will be undertaken to collect site-specific data and to identify the location and/or extent of Annex I habitats present within the benthic subtidal ecology Study Area. For safety reasons, the survey will be unable to sample within the 500 m zones. However, samples as part of this survey will be obtained as close as practicable (from a safety perspective) to Asset 500 m safety zones. Existing Asset specific surveys are considered to be sufficient to characterise the area as it is at present.	No specific modelling is required, instead the area of impact will be assessed through the seabed footprint associated with the PDE. CIEEM (2022) guidance for ecological impact assessments will be followed.
Increased SSC and associated deposition (including mobilisation of potential contaminants)	Scoped in	Sediment disturbance as a result of installation and decommissioning activities may result in indirect impacts on benthic ecology as a result of increases in SSC through pathways including reduced water clarity (due to increased SSC) and potential smothering due to sediment deposition. Within the 500 m zone, this includes potential for mobilisation of potential contaminants. While the extent of this contamination is likely to be largely constrained within the extent of the Asset 500 m zones, disturbance may make such contaminants more readily available. Furthermore, the effects of this mobilisation is not limited to within the 500 m zones.	Benthic subtidal ecology surveys for the Greenfield Scope will be undertaken to collect site-specific data and to identify the location and/or extent of benthic habitats present within the benthic subtidal and intertidal ecology Study Area. For safety reasons, the survey will be unable to sample within the 500 m zones. However, samples as part of this survey will be obtained as close as practicable (from a safety perspective) to Asset 500 m safety zones. Existing Asset specific surveys are considered to be sufficient to characterise the area as it is at present.	The primary productivity and the corresponding effects of the potential impact will be considered and habitat maps will be produced as part of the benthic ecology technical report. The assessment of increased SSC and associated deposition will be conducted in line with Cefas Action Level guidelines.
Increased risk of introduction of INNS	Scoped out	The movement of vessels during the installation and decommissioning phases of the Marine Scheme have the potential to result in the introduction of INNS. A CEMP (such as an INNS Management Plan) and adherence to relevant legislation and guidance will ensure that all required mitigation measures are in place so that the potential for the introduction of INNS are minimised. Through these measures the discharges of ballast waters and biofouling of vessels will be controlled. For these reasons, it is considered that there is no potential pathway for significant impacts resulting from the installation of the HVAC Cables and disturbance will not generate significant impacts to benthic ecology receptors. This potential impact is therefore scoped out		
Accidental release of pollutants	Scoped out	The accidental release of pollutants is limited to oil and fluid emissions associated with any Marine Scheme vessels. The potential release of contaminates as a result of operation and maintenance works are anticipated to be highly localised and temporary. Designed in measures, such as a CEMP including Marine Pollution Contingency Plans and adherence to MARPOL, will ensure that measures are adopted to ensure that the potential for accidental release of contaminants is minimised. This potential impact is therefore scoped out		
Operation and Maintenance				
Permanent benthic habitat / species loss or disturbance, and permanent	Scoped out	There is the potential for the permanent loss or disturbance to habitats. Rock protection and the introduction of hard substrate (rock and BLP jackets and piles) has the potential to change/alter the seabed and supporting habitats. However, the area within the Brownfield Scope is already highly modified by the presence of other installations/rock that any impact associated with the Marine Scheme would not be discernible from existing modified		

Potential Impact	Scoping Result	Justification	Information Required to Inform the Assessment	Assessment Method
change/alteration to substrata and habitats.		baseline conditions. Furthermore, there are no known features of conservation importance within the Asset 500 m safety zones and installation of rock protection and the BLPs would not result in a loss of any such feature. This potential impact is therefore scoped out.		
Increases SSC and associated deposition (including mobilisation of potential contaminants)	Scoped out	Sediment disturbance arising from operation and maintenance activities has the potential to result in direct and/or indirect impacts on benthic habitats and communities as a result of increased sediment disturbance and associated deposition. This would be highly localised to areas where there is maintenance required on a cable to fix a fault or damage, or where a cable has become exposed and requires re-burial. These are not considered to be regular/routine activities and would be undertaken only as and when required in the event of damage. Given the limited scope and frequency of these activities within an area which is already considered to be modified, there is not likely to be any impacts on the benthic ecology within the Asset 500 m safety zones associated with increases SSC and associated deposition. The benthos within the areas covered by the Brownfield Scope are already exposed to levels of contamination which are, on occasion, above background levels. This potential impact is therefore scoped out		
Colonisation of hard structures	Scoped out	Cable protection placed on the seabed and the BLPs introduce new hard substrates which would typically be colonised by a variety of marine organisms. While this has the potential to lead to localised changes in biodiversity, the Asset 500 m zones already contain a considerable number of hard structures. Owing to Asset ages, these majority of structures within the 500 m zones have likely been in place for over two decades. As indicated by Asset-specific data, the benthic communities within the 500 m zones are already affected by anthropogenic disturbance. Therefore, the baseline environment within the 500 m zones is already altered. As such, the installation of additional hard structures in the form of cable protection and the BLPs, will not perceptibly affect the benthic ecology of the area beyond present altered conditions. This potential impact is therefore scoped out.		
Changes in physical processes from cable protection measures and the BLPs	Scoped out	The presence of cable protection and the BLPs have the potential to induce localised changes to tidal flow, resulting in potential changes to sediment transport regime and associated effects on benthic habitats and communities (Section 6). However, within the Asset 500 m safety zones, the scale of this change will be limited. Within these areas, the seabed is highly modified with numerous physical barriers to these processes present (associated with the structures already in place). Consequently, near bed flows within the 500 m safety zones may be influenced by existing infrastructure. Therefore, the presence of cable protection measures and the BLPs associated with the Marine Scheme will not affect benthic ecology as a result of changes to physical processes. This potential impact is therefore scoped out.		
Impacts to benthic communities as a result of thermal load or electromagnetic field (EMF) arising from the cable during operation	Scoped out	Subsea cables emit EMFs, with high-voltage AC or DC cables emitting the greatest EMFs. There is the potential for thermal load and/or EMF during operation to impact benthic species. The level of exposure to EMF or thermal load will be dependent on the type of cable burial and protection measures adopted. Several studies have investigated the impacts of EMFs on benthic organisms, including crustaceans and molluscs. Tank-based experiments using simulated EMF investigated the impacts on several benthic invertebrate species common in the northeast Atlantic. There is no evidence for biological effects from EMF of the magnitude that would be associated with Marine Scheme cables. For these reasons, it is considered that there is no potential pathway for significant impacts resulting from the operation and maintenance of the Marine Scheme. The potential impact is therefore scoped out. Further justification for scoping this impact out is presented in Section 8.7.1.		
Accidental release of pollutants	Scoped out	The accidental release of pollutants is largely limited to oil and fluid emissions associated with any vessels. The potential release of contaminates as a result of operation and maintenance works are anticipated to be highly localised and temporary. Designed in measures, such as a CEMP including Marine Pollution Contingency Plans and adherence to MARPOL guidance, will ensure that measures are adopted to ensure that the potential for accidental release of contaminants is minimised. For these reasons, it is considered that there is no potential pathway for significant impacts resulting from the operations of the offshore cables to generate significant impacts to benthic ecology receptors. This potential impact is therefore scoped out		
Introduction and spread of INNS	Scoped out	The movement of vessels during the operation and maintenance phases of the Marine Scheme have the potential to result in the introduction of INNS. A CEMP (such as an INNS Management Plan) and adherence to relevant legislation and guidance will ensure that all required mitigation measures are in place so that the potential for the introduction of INNS are minimised. Through these measures the discharges of ballast waters and biofouling of Marine Scheme vessels will be controlled. For these reasons, it is considered that there is no potential pathway for significant impacts resulting from the operations of the offshore cables to generate significant impacts to benthic ecology receptors. This potential impact is therefore scoped out		

Cumulative and transboundary impacts are outlined for the Greenfield Scope in Section 8.7.1. The predicted effects of the Brownfield Scope are anticipated to be highly localised, therefore there is no potential for interaction with other projects, plans and activities, which could result in a cumulative effect on benthic ecology receptors. Consequently, cumulative impacts with regards to the Brownfield Scope are proposed to be scoped out of the EIA and will not be assessed further within the EIAR.

Given the proportionately small area within the Asset 500 m safety zones, it is not expected that there will be any potential for transboundary impacts on benthic ecology receptors as a result of installation, operation and maintenance or decommissioning activities associated with the Marine Scheme. As in Section 8.7.1, potential transboundary impacts on benthic ecology receptors with regards to the Brownfield Scope are therefore proposed to be scoped out of the EIA and will not be assessed further within the EIAR.

8.11.3 Brownfield Scoping Questions

The Applicant would request responses to the Brownfield scoping questions of relevance to Section 8. Benthic Ecology. Please respond to Question 6 in Table 1-3.

8.12 References

Albert, L., Maire, O., Olivier, F., Lambert, C., Romero-Ramirez, A., Jolivet, A., Chauvaud, L. and Chauvaud, S. (2022). Can artificial magnetic fields alter the functional role of the blue mussel, Mytilus edulis? Marine Biology, 169(6). doi:https://doi.org/10.1007/s00227-022-04065-4.

Aristarkhov, V.M., Arkhipova, G.V. and Pashkova, G.K., 1988. Changes in common mussel biochemical parameters at combined action of hypoxia, temperature and magnetic-field. IZVESTIYA AKADEMII NAUK SSSR SERIYA BIOLOGICHESKAYA, (2), pp.237-245.

Bochert, R. and Zettler, M.L. (2004). Long-term exposure of several marine benthic animals to static magnetic fields. Bioelectromagnetics, 25(7), pp.498–502. doi:https://doi.org/10.1002/bem.20019.

Bochert, R. and Zettler, M.L., 2004. Long-term exposure of several marine benthic animals to static magnetic fields. Bioelectromagnetics: Journal of the Bioelectromagnetics Society, The Society for Physical Regulation in Biology and Medicine, The European Bioelectromagnetics Association, 25(7), pp.498-502.

bp (2023a). ETAP Electrification Concept Development Summary Reporting of Environmental Baseline/Monitoring Data. Doc No: NS057-EV-REP-040-00003.

bp (2023b). Marnock ETAP PDR MAT Environmental Justification Document. MAT reference number PRA/143

CIEEM (2019). Guidelines for Ecological Impact Assessment in the UK and Ireland. https://cieem.net/wpcontent/uploads/2018/08/ECIA-Guidelines-2018-Terrestrial-Freshwater-Coastal-and-Marine-V1.2-April22-Compressed.pdf.

EMODnet (2019). Seabed Habitat. https://www.emodnet-seabedhabitats.eu/access-data/launch-mapviewer/

EU Commission (2013). Interpretation Manual of European Union Habitats. https://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/Int_Manual_EU28.pdf

Fugro (2011). Environmental Monitoring Survey Shearwater Platform UKCS 22/30b. FSLTD Report No: 00305.6V1.2

Fugro (2013). Environmental Monitoring Survey Shearwater UKCS Block 22/30b. FSLTD Report No. 130927

Fugro (2019a). Habitat Assessment Report Shearwater UKCS Block 22/30a. Fugro Report No.: 191007.8V3.1

Fugro (2019b). Environmental Monitoring Survey and Habitat Assessment Report Shearwater Field UKCS Block 22/30b. Fugro Document No.: 180725-R-010(01)

Gardline (2019a). Talbot Site and Route Survey UKCS Blocks 30/7, 30/2 and 30/13. Habitat Assessment Report. Reference: 327960.

Gardline (2019b). Dunnottar Site Survey UKCS Block 30/8. Habitat Assessment Report. Reference: 327960.

Gardline (2019c). UKCS 30/7 Jade South RWL Site Survey: Seafloor and HR Seismic Hazard Survey. Reference: 11387

Gardline (2023). Greenfield CNSE Environmental Baseline Survey Report. Report Ref. 11823.E04

Gilbert, F., Rivet, L. and Bertrand, J.C., 1994. The in vitro influence of the burrowing polychaete *Nereis diversicolor* on the fate of petroleum hydrocarbons in marine sediments. Chemosphere, 29(1), pp.1-12.

Golding. N., Albrecht. J. & McBreen. F. 2020. Refining criteria for defining areas with a 'low resemblance' to Annex I stony reef: Workshop Report. JNCC Report No. 656, JNCC, Peterborough, ISSN 0963-8091.

Gubbay, S. 2007. Defining and managing Sabellaria spinulosa reefs: Report of an inter-agency workshop 1-2 May, 2007. JNCC Report No. 405. https://data.jncc.gov.uk/data/ecdbc5ba-e200-47e3-b7c6-adf464287712/JNCC-Report405-FINAL-WEB.pdf.

Harbour Energy (2023). J Area Environmental Description.

Hedman, J.E., Gunnarsson, J.S., Samuelsson, G. and Gilbert, F. (2011). Particle reworking and solute transport by the sediment-living polychaetes Marenzelleria neglecta and Hediste diversicolor. Journal of Experimental Marine Biology and Ecology, 407(2), pp.294-301.

Hedman, J.E., Gunnarsson, J.S., Samuelsson, G. and Gilbert, F. (2011). Particle reworking and solute transport by the sediment-living polychaetes Marenzelleria neglecta and Hediste diversicolor. Journal of Experimental Marine Biology and Ecology, 407(2), pp.294–301. doi:https://doi.org/10.1016/j.jembe.2011.06.026.

Irving, R. (2009). The identification of the main characteristics of stony reef habitats under the habitats Directive. Summary Report of an Inter-Agency Workshop 26 to 27 March 2008. JNCC Report 432. https://data.jncc.gov.uk/data/21693da5-7f59-47ec-b0c1-a3a5ce5e3139/JNCC-Report-432-FINAL-WEB.pdf.

Jakubowska, M., Urban-Malinga, B., Otremba, Z. and Andrulewicz, E. (2019). Effect of low frequency electromagnetic field on the behavior and bioenergetics of the polychaete Hediste diversicolor. Marine Environmental Research, 150, p.104766. doi:https://doi.org/10.1016/j.marenvres.2019.104766.

Jakubowska-Lehrmann, M., Białowąs, M., Otremba, Z., Hallmann, A., Śliwińska-Wilczewska, S. and Urban-Malinga, B. (2022). Do magnetic fields related to submarine power cables affect the functioning of a common bivalve? Marine Environmental Research, 179, p.105700. doi:https://doi.org/10.1016/j.marenvres.2022.105700.

Jenkins, C., Eggleton, J., D, Barry, J., and O'Connor, J (2018). Advances in assessing Sabellaria spinulosa reefs for ongoing monitoring. Ecology and Evolution 2018, 1-15. https://onlinelibrary.wiley.com/doi/full/10.1002/ece3.4292. Jakubowska, M., Urban-Malinga, B., Otremba, Z. and Andrulewicz, E., 2019. Effect of low frequency electromagnetic field on the behavior and bioenergetics of the polychaete Hediste diversicolor. Marine environmental research, 150, p.104766.

JNCC (2014). Priority Marine Features in Scotland's Seas. https://hub.jncc.gov.uk/assets/151356a8-06cc-43fc-b724-c8212089a2da.

JNCC (2016). Annex I Submarine structures made by leaking gas. https://hub.jncc.gov.uk/assets/b47ebc16-7b74-4a69-bd4b-7e29c0584d59.

JNCC (2018). UK Protected Area Datasets for Download. https://jncc.gov.uk/our-work/uk-protected-areadatasets-for-download

JNCC (2021). Annex I Reefs in UK offshore waters (public). https://hub.jncc.gov.uk/assets/992dfef7-3267-43db-b351-5927bf0621d4

JNCC (2023a). East of Gannet and Montrose Fields MPA. https://jncc.gov.uk/our-work/east-of-gannet-and-montrose-fields-mpa/#:~:text=The%20East%20of%20Gannet%20and%20Montrose%20Fields%20MPA%20lies%20to,ocean%20quahog%20(Arctica%20islandica)

JNCC (2023b). Turbot Bank MPA. https://jncc.gov.uk/our-work/turbot-bank-mpa/

Judd. A. (2012). Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects. https://tethys.pnnl.gov/sites/default/files/publications/CEFAS_2012_Eenvironmental_Assessment_Guidance.pdf.

Love, M.S., Nishimoto, M.M., Clark, S., McCrea, M. and Bull, A.S. (2017). Assessing potential impacts of energized submarine power cables on crab harvests. Continental Shelf Research, 151, pp.23–29. doi:https://doi.org/10.1016/j.csr.2017.10.002.

Marine Scotland (2013). Feature Activity Sensitivity Tool (FEAST). http://www.marine.scotland.gov.uk/FEAST/.

Marine Scotland (2023). Spatial data relating to benthic ecology on National Marine Plan Interactive (NMPI). https://marinescotland.atkinsgeospatial.com/nmpi/.

Milton S. Love, Mary M. Nishimoto, Scott Clark, Ann Scarborough Bull. (2015). Identical Response of Caged Rock Crabs (Genera Metacarcinus and Cancer) to Energized and Unenergized Undersea Power Cables in Southern California, USA, Bulletin, Southern California Academy of Sciences, 114(1), 33-41.

MMT (2013). Environmental survey report. https://marine.gov.scot/sites/default/files/environmental_survey_report_101462-sto-mmt-sur-rep-environ-03.pdf

NatureScot (2020a). SAC Scotland ESRI. https://www.nature.scot/professional-advice/protected-areasand-species/protected-areas/international-designations/european-sites/special-areas-conservation-sacs.

NatureScot (2020b). SSSI Scotland ESRI. https://data.gov.uk/dataset/d64bf689-4ce8-465b-b00e6a57dec94a22/site-of-special-scientific-interest-scotland.

NatureScot (2020c). SPA Scotland ESRI. https://data.gov.uk/dataset/549cfe11-819d-4b0c-9479-9c70135fe9cf/special-protection-area-scotland.

NatureScot (2020d). MPA Scotland ESRI. https://marine.gov.scot/maps/844.

NatureScot (2023a). Bullers of Buchan Coast SSSI. https://sitelink.nature.scot/site/271.

NatureScot (2023b). Southern Trench MPA(NC). https://sitelink.nature.scot/site/10477

Normandeau, Exponent, T. Tricas, and A. Gill. 2011. Effects of EMFs from Undersea Power Cables on Elasmobranchs and Other Marine Species. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement, Pacific OCS Region, Camarillo, CA. OCS Study BOEMRE 2011-09.

OSPAR (2008). List of threatened and/or endangered species and habitats. https://www.ospar.org/workareas/bdc/species-habitats/list-of-threatened-declining-species-habitats.

OSPAR (2009). Assessment of the environmental impacts of cables. https://qsr2010.ospar.org/media/assessments/p00437_Cables.pdf.

OSPAR (2013). Background document on Sabellaria spinulosa reefs. https://www.ospar.org/documents?v=7342.

Pearce, B., and Kimber, J. (2020). The Status of Sabellaria spinulosa Reef off the Moray Firth and Aberdeenshire Coasts and Guidance for Conservation of the Species off the Scottish East Coast CR/2018/38. https://data.marine.gov.scot/sites/default/files//Scottish%20Marine%20and%20Freshwater%20Science%20%28SMFS%29%20Vol%2011%20No%2017_%20The%20Status%20of%20Sabellaria%20spinulosa%20Reef%20%281%29.pdf

Reiss, H., Cunze, S., König, K., Neumann, H. and Kröncke, I., 2011. Species distribution modelling of marine benthos: a North Sea case study. Marine Ecology Progress Series, 442, pp.71-86.

Scotland England Green Link 1 / Eastern Link 1 -Marine Scheme Environmental Appraisal Report Volume 3 Appendix 2.1 -Eastern Link EMF and Compass Deviation Assessment National Grid Electricity Transmission and Scottish Power Transmission. (2022). Available at: https://marine.gov.scot/sites/default/files/environmental_appraisal_report_v3_-_appendix_2.1_eastern_link_emf_and_compass_deviation_assessment_-_redacted.pdf

Scott, K., Harsanyi, P., Easton, B.A.A., Piper, A.J.R., Rochas, C.M.V. and Lyndon, A.R. (2021). Exposure to Electromagnetic Fields (EMF) from Submarine Power Cables Can Trigger Strength-Dependent Behavioural and Physiological Responses in Edible Crab, Cancer pagurus (L.). Journal of Marine Science and Engineering, [online] 9(7), p.776. doi:https://doi.org/10.3390/jmse9070776.

Scott, K.; Harsanyi, P.; Easton, B.A.A.; Piper, A.J.R.; Rochas, C.M.V.; Lyndon, A.R. Exposure to Electromagnetic Fields (EMF) from Submarine Power Cables Can Trigger Strength-Dependent Behavioural and Physiological Responses in Edible Crab, Cancer pagurus (L.). J. Mar. Sci. Eng. 2021, 9, 776. https://doi.org/10.3390/jmse9070776

Scottish Government (2015). Scotland's Biodiversity: a route map to 2020. https://www.gov.scot/publications/scotlands-biodiversity-route-map-2020/.

Shell (2021). Shearwater Environmental Assessment Justification. MAT reference number PRA/52.

SNH (2011). Guidance on Survey and Monitoring in Relation to Marine Renewable Developments in Scotland – Volume 5: Benthic Habitats. https://tethys.pnnl.gov/sites/default/files/publications/SNH-2011-Volume-5.pdf.

Tański, A., Formicki, K., Śmietana, P., Sadowski, M. and Winnicki, A., 2005. Sheltering behaviour of spinycheek crayfish (Orconectes limosus) in the presence of an artificial magnetic field. Bulletin Francais de la Peche et de la Pisciculture, (376-377), pp.787-793.

Taormina, B., Bald, J., Want, A., Thouzeau, G., Lejart, M., Desroy, N. and Carlier, A. (2018). A review of potential impacts of submarine power cables on the marine environment: Knowledge gaps, recommendations and future directions. Renewable and Sustainable Energy Reviews, [online] 96, pp.380–391. doi: https://doi.org/10.1016/j.rser.2018.07.026.

TotalEnergies (2022). Elgin Production Operations Environmental Assessment Justification Document. MAT Reference Number PRA/141

Tyler-Walters, H., James, B., Carruthers, M., Wilding, C., Durkin, O., Lacey, C., Philpott, E., Adams, L., Chaniotis, P.D., Wilkes, P.T.V., Seeley, R., Neilly, M., Dargie, J., and Crawford-Avis, O.T. (2016). Descriptions of Scottish Priority Marine Features (PMFs). Scottish Natural Heritage Commissioned Report No. 406. Scottish Natural Heritage (SNH) Edinburgh

9 FISH AND SHELLFISH ECOLOGY

9.1 Introduction

This section of the Scoping Report identifies the fish and shellfish ecology receptors of relevance to the offshore aspects of the Marine Scheme and considers the potential impacts from the installation, operation and maintenance and decommissioning phases of the proposed Marine Scheme.

It should be noted that whilst classified as a fish, basking shark (*Cetorhinus maximus*) have not been included in this section and instead have been discussed in Section 11 Marine Mammals. SACs which have been designated due to the presence of fish and shellfish species have been discussed briefly but details will be provided in the supporting HRA (which will be submitted alongside and in support of the EIAR).

This section of the Scoping Report should be read in conjunction with the following sections:

- Section 6 Physical Environment;
- Section 7 Benthic Ecology; and
- Section 12 Commercial Fisheries.

9.2 Legislation, Policy and Guidance

In addition to the relevant policy and legislation described in Section 2, the following section outlines the legislation, policy and guidance that will be taken into consideration in relation to the fish and shellfish ecology EIA

9.2.1 International Legislation and Policy

- The Convention on the Conservation of European Wildlife and Natural Habitats (the 'Bern Convention') adopted in 1979; and
- Convention for the Protection of the Marine Environment of the North-East Atlantic (the 'OSPAR Convention') adopted in 1998 and amended in 2007.

9.2.2 National Legislation

UK

- Wildlife and Countryside Act 1981; and
- The Fisheries Act 2020.

Scotland

- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended); and
- Nature Conservation (Scotland) Act 2004 (Scottish Government, 2004).

9.2.3 National Policy

UK

- UK Post 2010 Biodiversity Framework (JNCC & DEFRA, 2012).

Scotland

- Scotland's Biodiversity: a route map to 2020 (Scottish Government, 2015).

9.2.4 Guidance

- Chartered Institute for Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in Britain and Ireland – Terrestrial, Freshwater, Coastal and Marine (CIEEM, Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Version 1.2, updated April 2022);
- Descriptions of Scottish Priority Marine Features (PMFs): NatureScot Commissioned Report No. 406 (Scottish waters only); and
- Nature Conservation Considerations and Environmental Best Practice for subsea cable for English Inshore and UK Offshore Waters (Natural England and JNCC, 2022).

9.3 Study Area

The fish and shellfish ecology Study Area is informed by the physical environment Study Area as detailed in Section 6 Physical Environment. The physical environment Study Area varies across the Marine Scheme, with a 10 km buffer applied to the Marine Scheme from MHWS to 65 km offshore and a 5 km buffer applied from 65 km offshore to the OCS and Assets.

To account for wider ranging migratory fish species, a wider regional Study Area, including a 50 km buffer, has been applied to the Marine Scheme to identify rivers and designated sites relevant to diadromous species (Figure 9-1)

The fish and shellfish ecology and wider regional Study Areas are referred to throughout the following sections.

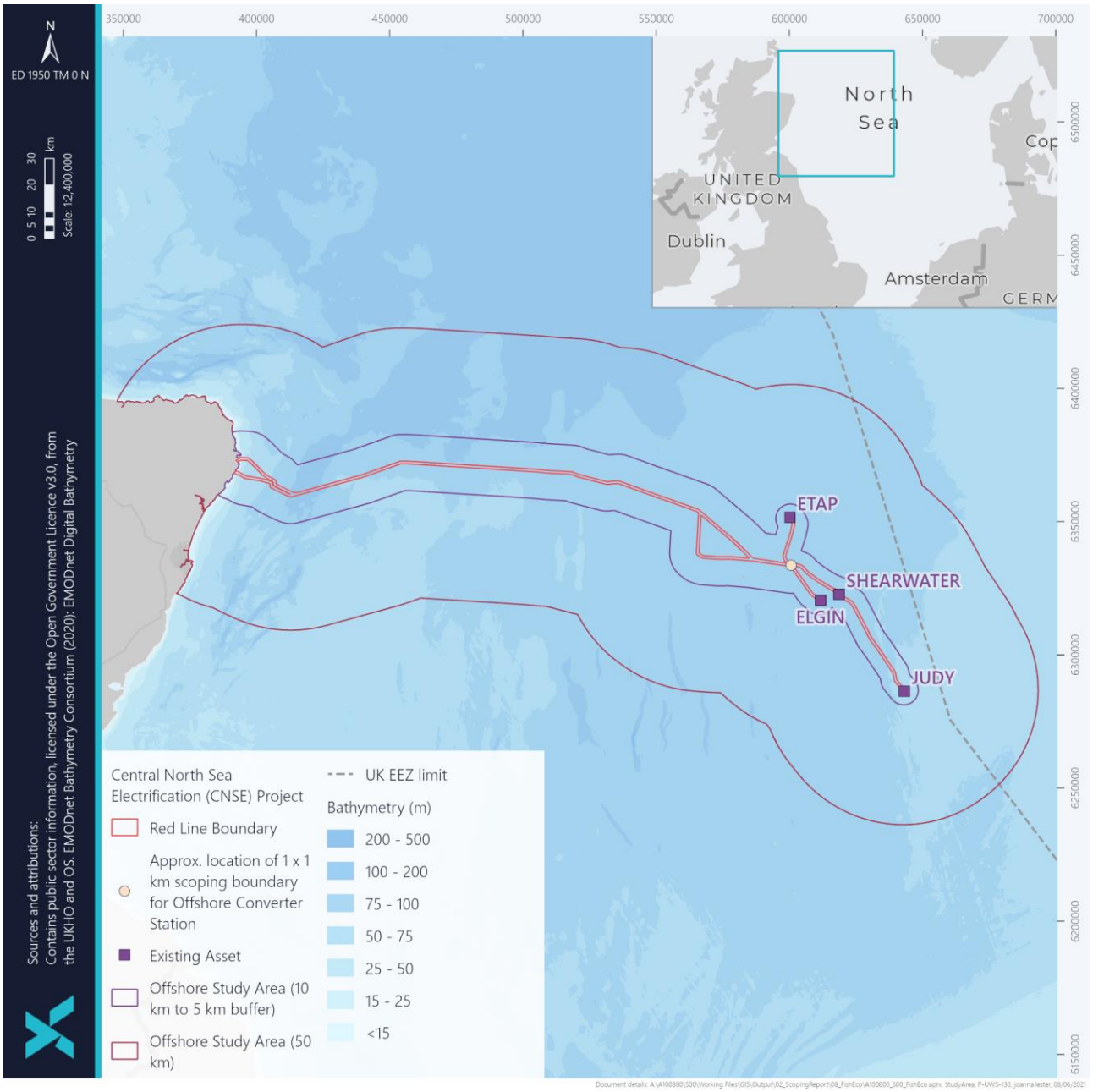

Figure 9-1 Fish and shellfish ecology Study Area

9.4 Key Data Sources

The existing data sets and literature with relevant coverage to the Marine Scheme which have been used to inform this Scoping Report and are proposed to inform the baseline characterisation for the EIA are outlined in Table 9-1.

Table 9-1 - Data sources for the fish and shellfish ecology assessment

Name of Source	Description / Link	Author	Date
Project specific survey data, including benthic, geophysical and geotechnical survey reports as available	Various	Various	TBD
Mapping the spawning and nursery grounds of selected fish for spatial spawning	https://docslib.org/doc/10530704/spawning-and-nursery-grounds-of-selected-fish-species-in-uk-waters	Ellis *et al.*	2012
Fishery sensitivity maps in British waters	https://marine.gov.scot/data/fisheries-sensitivity-maps-british-waters-coull-et-al-1998	Coull *et al.*	1998
Updating fisheries sensitivities maps in British waters	https://data.marine.gov.scot/dataset/updating-fisheries-sensitivity-maps-british-waters	Aires *et al.*	2014
Spawning grounds of Atlantic cod (*Gadus morhua*) in the North Sea	https://academic.oup.com/icesjms/article/73/2/304/2614292	González-Irusta and Wright	2015
Spawning grounds of haddock (*Melanogrammus aeglefinus*)	https://www.sciencedirect.com/science/article/abs/pii/S0165783616301771?via%3Dihub	González-Irusta and Wright	2016
Spawning grounds of whiting (*Merlangius Merlangus*)	https://www.sciencedirect.com/science/article/abs/pii/S0165783617301790?via%3Dihub	González-Irusta and Wright	2017
Landings Data (live weight) by species	https://www.gov.uk/government/statistics/uk-sea-fisheries-annual-statistics-report-2021	MMO	2016-2020
The Marine Life Information Network	https://www.marlin.ac.uk/	MarLIN	2023
National Biodiversity Network (NBN) Atlas	https://nbnatlas.org/		2015
Survey data/reports available through International Council for the Exploration of the Sea (ICES), including International Herring Larvae Survey (IHLS) and the International Bottom Trawl Survey (IBTS) (North Sea)	https://www.ices.dk/data/data-portals/Pages/Eggs-and-larvae.aspx https://www.ices.dk/data/dataset-collections/Pages/Fish-trawl-survey.aspx	ICES ICES	Ongoing Ongoing
Salmon Smolt Surveying on the Sunbeam	https://www.bodc.ac.uk/resources/inventories/cruise_inventory/programmes/1419h.pdf	Marine Scotland	2018
UK Protected Sites	https://jncc.gov.uk/our-work/uk-protected-areas/	JNCC	2023

Name of Source	Description / Link	Author	Date
The International Union for Conservation of Nature (IUCN) Red List of Threatened Species	https://www.iucnredlist.org/en	IUCN	2023
Guidelines for Ecological Impact Assessment in the UK and Ireland Terrestrial, Freshwater, Coastal, and Marine	https://cieem.net/resource/guidelines-for-ecological-impact-assessment-ecia/	CIEEM	2022
A verified distribution model for the lesser sandeel (*Ammodytes marinus*)	https://spatialdata.gov.scot/geonetwork/srv/api/records/Marine_Scotland_FishDAC_12377	Langton *et al.*	2021
A summary of demersal fish tagging data maintained and published by Cefas	www.cefas.co.uk/publications/techrep/tech135.pdf	Burt *et al.*	2006
FishBase, with special emphasis on the fish of Europe	https://fishbase.mnhn.fr/search.php?region=europe	FishBase	2023

The datasets and information sources as outlined in Table 9-1, with large-scale coverage are relevant for characterising the fish and shellfish ecology baseline. Fisheries landings datasets provide sufficient information, detail and coverage to characterise and describe the fish and shellfish baseline within the fish and shellfish ecology Study Area. Any previous monitoring from existing projects may also add to this information. Benthic surveys are being undertaken and the information provided from these will provide further understanding of the habitat classifications within the fish and shellfish ecology Study Area.

Given that fish are highly mobile, both temporally and spatially, a site-specific survey only provides coverage of the species present in a particular area at a particular time. This has the potential to skew the baseline. Furthermore, given the scale of the Marine Scheme, it is not considered necessary to conduct site-specific surveys for fish. Considering this, the volume of existing data and the low value of site-specific data, no fish or shellfish surveys will be undertaken for the Marine Scheme. Where appropriate, the conclusions drawn from the benthic ecology and commercial fisheries assessment (as outlined in Sections 7 and 12) will be used to inform the assessment of fish and shellfish ecology associated with the Marine Scheme.

9.5 Baseline Environment

An initial desk-based review of literature and available data sources (see Section 9.4) has been undertaken to support this Scoping Report. The findings of this research are presented below in order to provide an understanding of the Marine Scheme environment and inform the scoping process.

The key fish and shellfish receptors which are likely to require consideration within the EIA are:

- Protected species;
- Key prey species;
- Commercially important species;

- Diadromous fish species which have migratory routes which pass through or close to the fish and shellfish ecology Study Area; and
- Fish and shellfish species with the following features:
  - Seabed dependence during any life stage, including spawning and/or nursery stages;
  - Sensitivity to underwater noise; and
  - Species with the ability to detect electrical or magnetic fields.

9.5.1 Fish and Shellfish Assemblage

Fish receptors relevant to the Marine Scheme within the fish and shellfish ecology Study Area include marine fish (pelagic and demersal), diadromous fish and elasmobranchs (skates and rays). Relevant shellfish receptors include crustaceans and molluscs.

Landings data have been used to identify fish and shellfish species which are anticipated to be present within the vicinity of the Marine Scheme, with further details of the landings data available in Section 12. The most frequently landed species in the fish and shellfish ecology Study Area include cod (*Gadus morhua*), crabs (*Cancer pagurus*), haddock (*Melanogrammus aeglefinus*), herring (*Clupea harengus*), mackerel (*Scomber scombrus*), monk or angler fish (*Lophius americanus*), Norway lobster (*Nephrops norvegicus*), sandeels (*Ammodytes marinus*), scallops (*Pecten maximus*), and whiting (*Merlangius merlangus*). European lobster (*Homarus gammarus*) are also identified as being of importance in the vicinity of Peterhead.

9.5.2 Diadromous Species

There is the potential for diadromous fish species to migrate to and from Scottish rivers in the vicinity of the Marine Scheme and, therefore, they may migrate through the fish and shellfish ecology Study Area at certain times of the year (JNCC, 2023). As a result of this it is possible that protected diadromous species, such as the Atlantic salmon *Salmo salar*, sea trout *Salmo trutta*, European eel *Anguilla anguilla*, sea lamprey *Petromyzon marinus* and river lamprey *Lampetra fluviatilis* may occur in proximity to the Marine Scheme in Scottish waters.

For the purpose of this Scoping Report, Atlantic salmon is the primary diadromous fish species considered, having potential for direct interaction with the Marine Scheme. A number of rivers identified as being of importance to Atlantic salmon are located within 50 km of the Marine Scheme (Figure 9-2, Table 9-2), including:

- The River Ugie;
- The River Ythan;
- The River Don;
- The River Deveron;
- The River Dee (also an SAC as detailed in Section 9.5.5);
- The Waters of Philorth;
- Invernettie Burn;
- Burn of Auchmacoy;
- Burn of Forvie; and
- Tarty Burn.

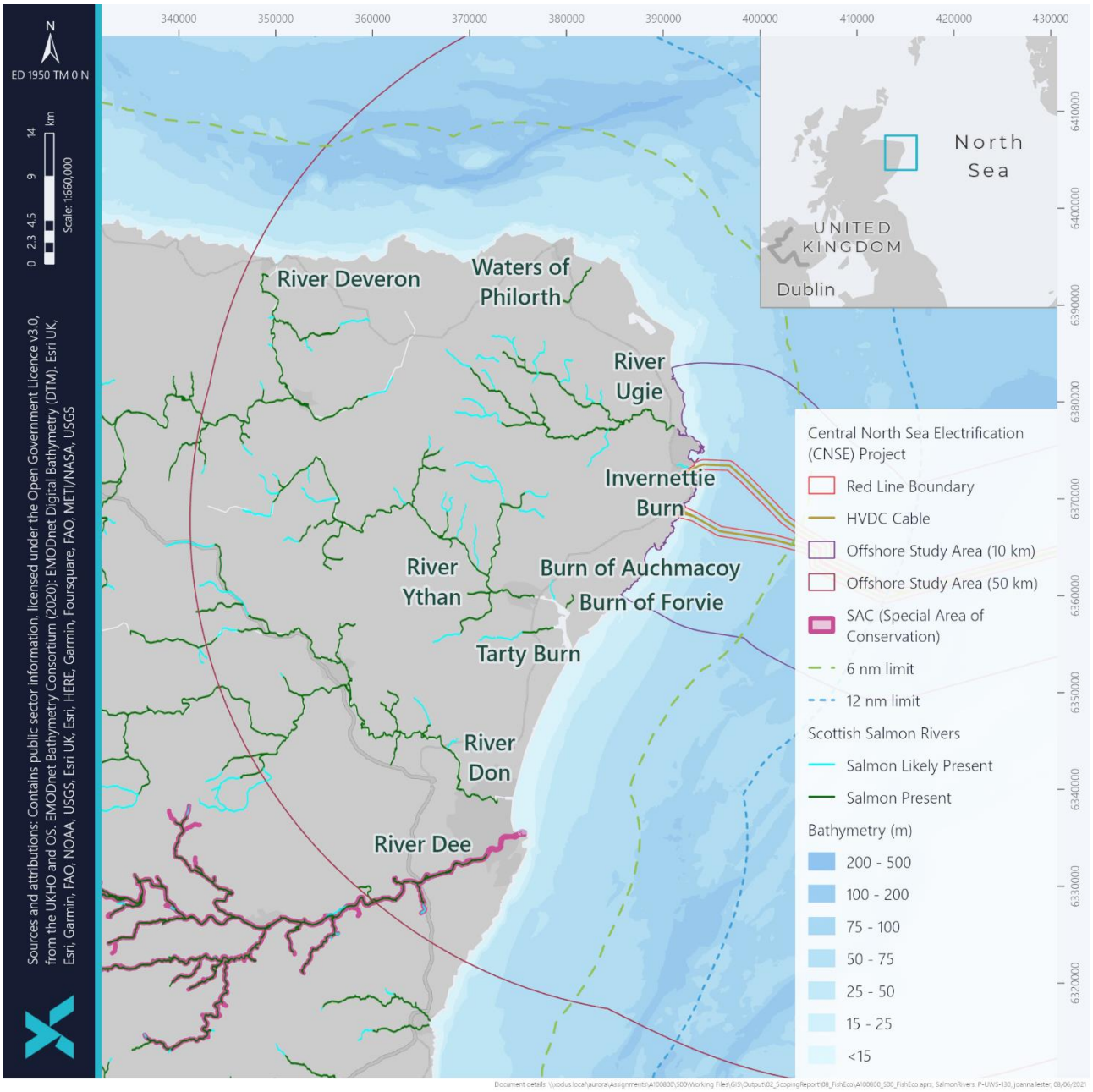

Figure 9-2 Salmon rivers within the fish and shellfish ecology Study Area

Table 9-2 Relevant river sites within the fish and shellfish ecology wider regional Study Area

Site Name	Distance from Study Area (km)
River Dee SAC (also an SAC as detailed in Section 8.5.5)	~40 km
River Don	~35 km
River Deveron	~47 km
River Ugie	~4 km
River Ythan	~18 km
Waters of Philorth	~25 km
Invernettie Burn	~0 km
Burn of Auchmacoy	~14 km
Burn of Forvie	~13 km
Tarty Burn	~17 km

No site-specific surveys are proposed to inform the impact assessment on migratory fish species. For the purposes of the impact assessment, it will be assumed that the aforementioned species are likely to be present within the fish and shellfish ecology Study Area, during key migration periods (e.g., adult migration to spawning rivers and smolt migration from natal rivers in the vicinity of the fish and shellfish ecology Study Area). The assessment will be informed by data and information from relevant surrounding projects and the scientific literature.

With respect to migratory fish species, the aim of the impact assessment will be to determine whether installation, operation and maintenance or decommissioning activities have the potential to lead to disruption to migration, e.g., installation noise potentially creating an effective barrier to fish migration. The timing of fish migration will therefore be an important element of the baseline characterisation. The sources for an indication of migratory times for the relevant species include previous projects (Seagreen EIA), recent papers (e.g. Newton et al, 2017; Godfrey et al, 2015; Malcolm et al, 2010; Malcolm et al, 2015), desktop data sources (rod catch data from rivers on the coast of Scotland) and Marine Scotland smolt survey data from the east coast of Scotland (Marine Scotland, 2018).

9.5.3 Elasmobranchs

Elasmobranchs utilise EMF to help navigate and forage for food and therefore have the potential to experience disruption when in the presence of subsea power cables. There is potential for several elasmobranch species to be present along the fish and shellfish ecology Study Area. These include common blue skate (*Dipturus batis*), spotted ray (*Raja montagui*), spurdog (*Squalus acanthias*), and tope shark (*Galeorhinus galeus*) (Ellis et al, 2012, MarLIN, 2023). Some of these species are of conservation concern, the common skate is listed as Critically Endangered whilst the spurdog is listed as vulnerable on the IUCN Red List and is a PMF.

9.5.4 Spawning and Nursery Grounds

Several species of fish which are of commercial and conservation importance depend on the seabed during key stages of their life cycle. Those found to have such dependence within the fish and shellfish ecology Study Area include the following: anglerfish, blue whiting, cod, common skate, haddock, herring, lemon sole, ling, mackerel, Norway lobster, plaice, saithe, sandeel, spotted ray, sprat, spurdog, Norway pout, tope shark, and whiting. Each of these species occur within the fish and shellfish ecology Study Area for at least one of the following key life cycles, spawning, or nursing (Aires et al 2014; Ellis et al, 2012).

Data from Coull et al, (1998) and Ellis et al, (2012) indicate that high and low intensity spawning grounds for Norway pout, sandeel and mackerel overlap with the fish and shellfish ecology Study Area, as well as spawning grounds of low intensity for cod and whiting and undetermined intensity for herring, lemon sole, Norway lobster, and sprat (Figure 9-3). The fish and shellfish ecology Study Area overlaps with the nursery grounds of anglerfish, blue whiting, cod, common skate, haddock, herring, lemon sole, ling, mackerel, Norway lobster, Norway pout, plaice, saithe, sandeel, spotted ray, sprat, spurdog, and tope shark (Figure 9-4 and Figure 9-5)

Figure 9-6 shows the potential for aggregations of juvenile fish which are less than one year old (Aires *et al.*, 2014). Haddock have the highest potential for aggregation within the fish and shellfish ecology Study Area (probability values up to 0.6 – 0.8) while hake, Norway pout, whiting, cod, and anglerfish all exhibit probability values of between 0.2 – 0.6 for presence within the fish and shellfish ecology Study Area. Herring, horse mackerel, mackerel, plaice, sole, and sprat all exhibit relatively low probability levels (0.05 – 0.2) and in very limited extents within the fish and shellfish ecology Study Area.

Herring, sandeels, and Norway lobster are demersal spawners, making them dependent on specific seabed conditions and hence more sensitive to impacts from marine installation activities. Conversely, Norway pout, mackerel, cod, whiting, lemon sole and sprat are broadcast spawners, and as such, eggs, once spawned, are pelagic and distributed through the water column and will therefore be carried by ocean currents and hence are less dependent on specific seabed conditions and less sensitive to marine installation activities. On this basis, only sandeel, herring and Norway lobster spawning grounds will be scoped into the EIA.

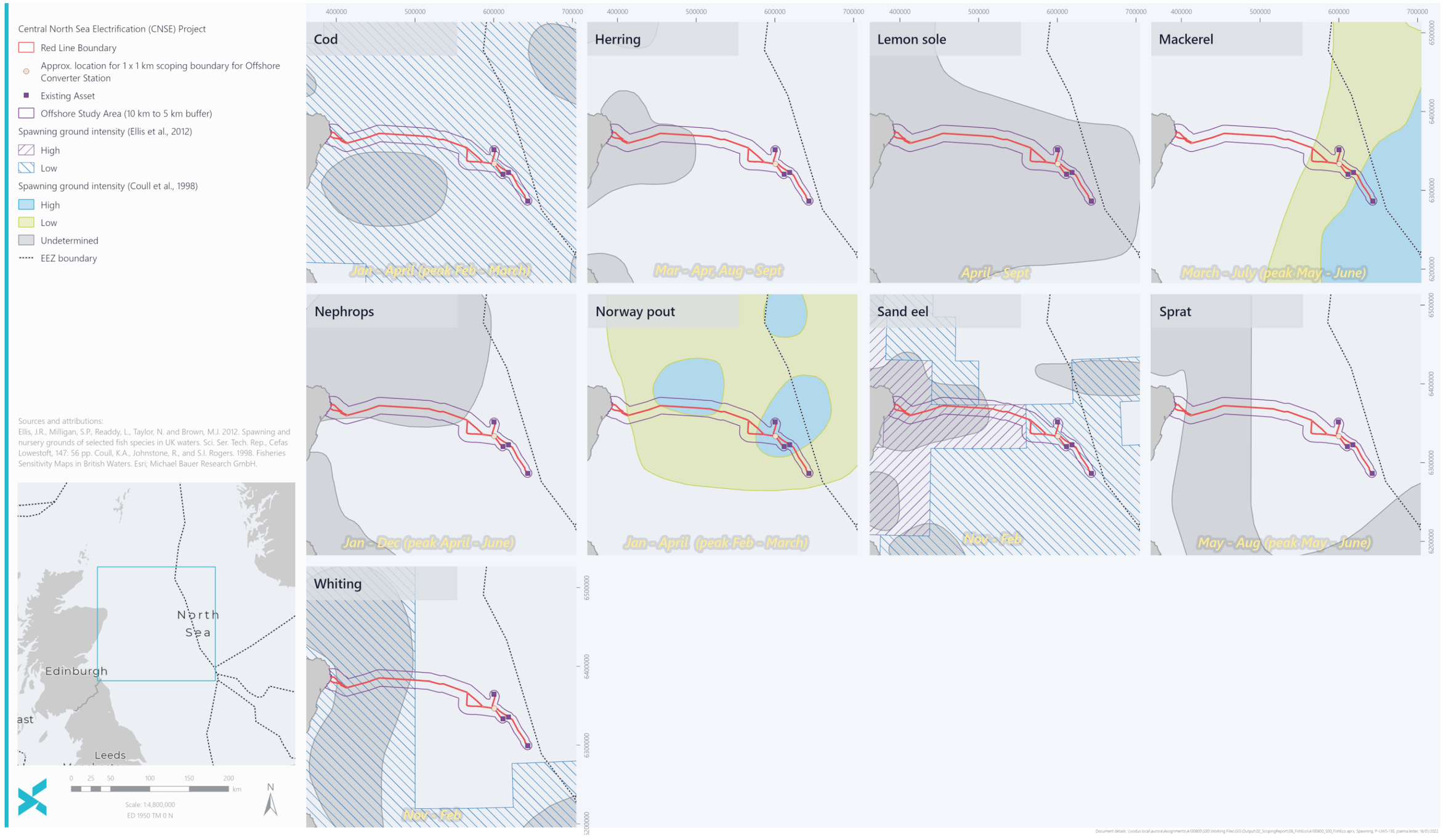

Figure 9-3 Overlap of spawning grounds for various species within the fish and shellfish ecology Study Area

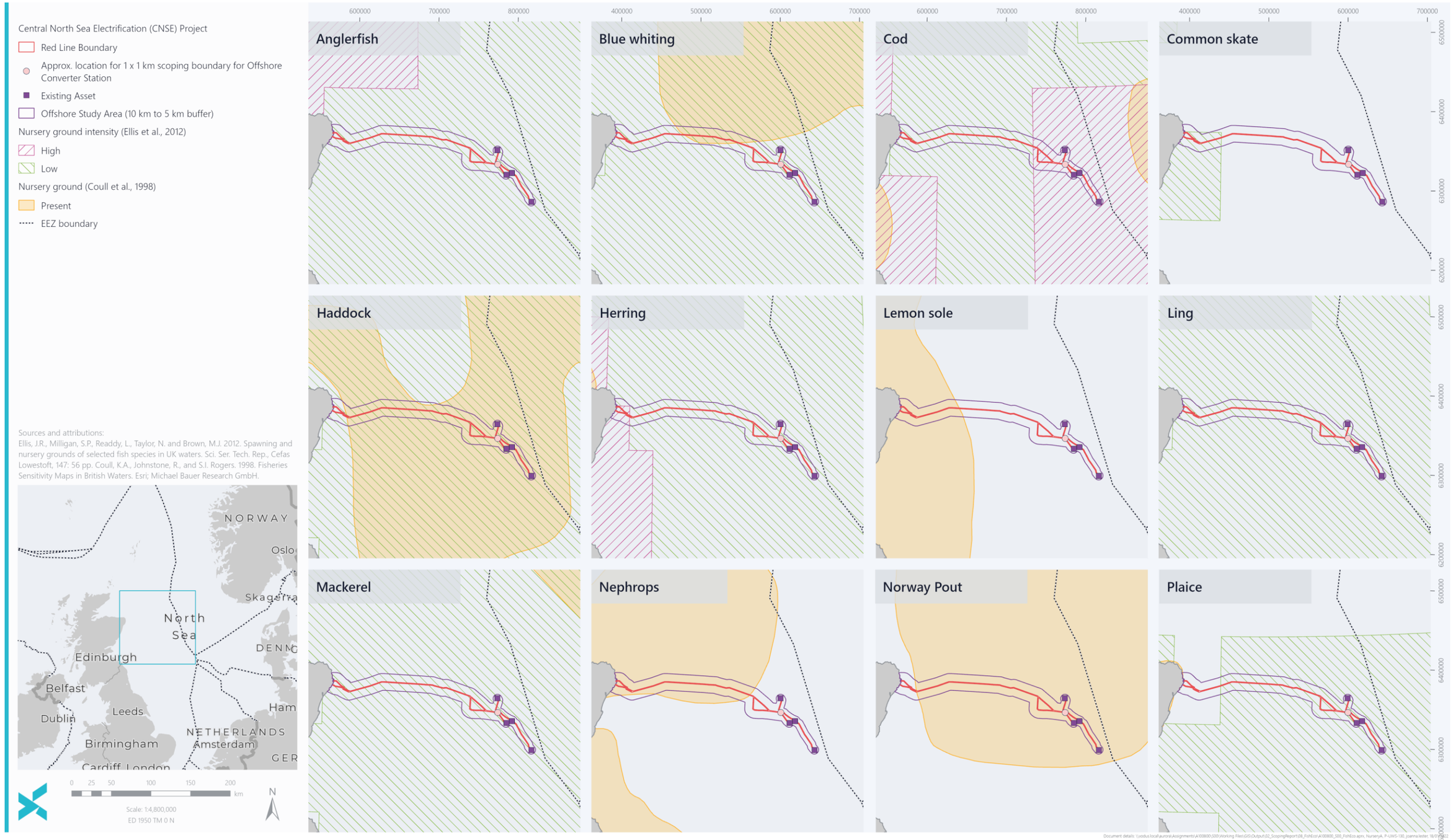

Figure 9-4 Overlap of nursery grounds for various species within the fish and shellfish ecology Study Area

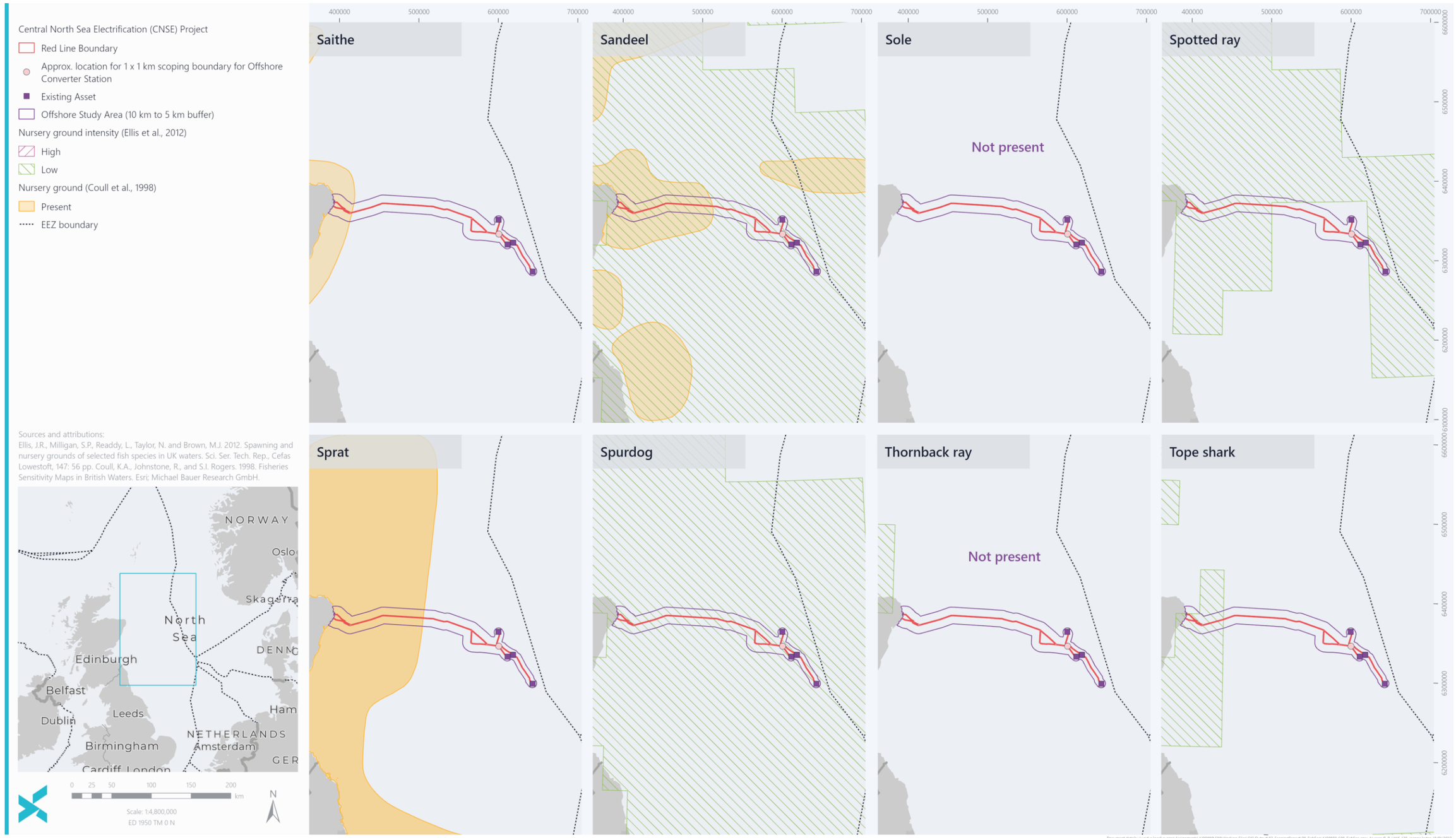

Figure 9-5 Overlap of nursery grounds for various species within the fish and shellfish ecology Study Area

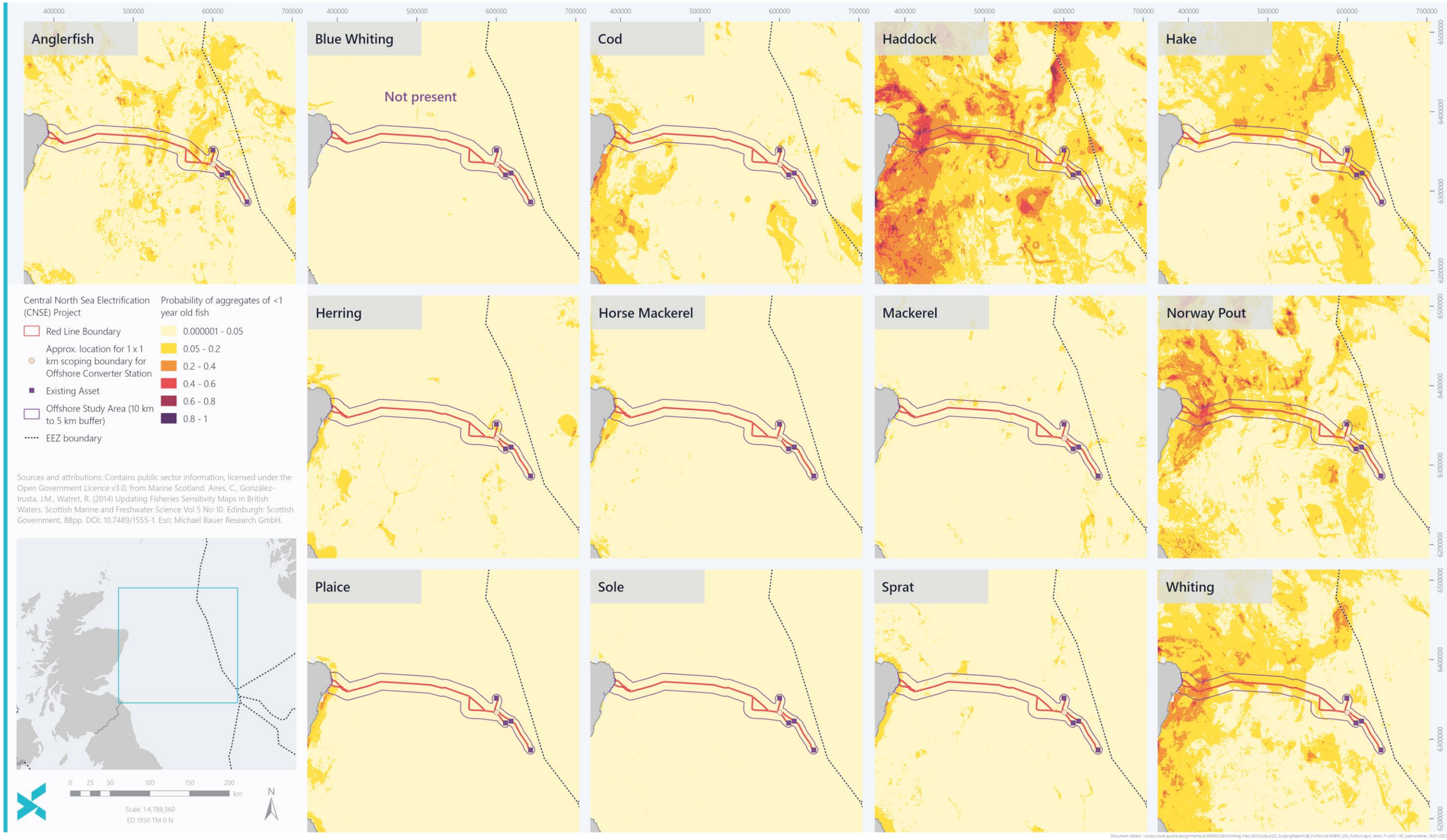

Figure 9-6 Overlap of aggregation probability for various species juveniles within the fish and shellfish ecology Study Area

9.5.5 Designated Sites and Protected Species

Shellfish are protected under The Water Environment (Shellfish Water Protected Areas: Designation) (Scotland) Order 2013, and The Water Environment (Shellfish Water Protected Areas: Environmental Objectives etc.) (Scotland) Regulations 2013.

The fish and shellfish ecology Study Area will directly interact with two designated sites for which fish and/or shellfish are a designated feature, including the East of Gannet and Montrose Fields NCMPA and the Turbot Bank NCMPA. When considering sites which are designated for migratory fish species, the River Dee SAC is located within the wider regional Study Area (as defined in Section 9.3). Further information on these sites can be found in Table 9-3 and seen in Figure 9-7.

These sites will be considered as receptors in the EIAR, and further assessed by the HRA and MPA assessment.

Table 9-3 Relevant designated sites within the fish and shellfish ecology Study Area

Site Name	Study Area	Qualifying Features	Comments
East of Gannet and Montrose Fields NCMPA	Within fish and shellfish ecology Study Area	Ocean quahog, Offshore deep sea muds	Large deep-sea mud habitat range, supporting a variety of invertebrates, including worms and molluscs. Key feeding habitat for various fish species.
Turbot Bank NCMPA	Within fish and shellfish ecology Study Area	Sandeels	Sandy bottom habitat supporting sandeel populations.
River Dee SAC	Within wider regional Study Area for fish and shellfish ecology	Atlantic Salmon	Large catchment on Scotland's east coast; highly accessible to salmon. Supports an estimated 4-5% of Scotland's salmon resource.

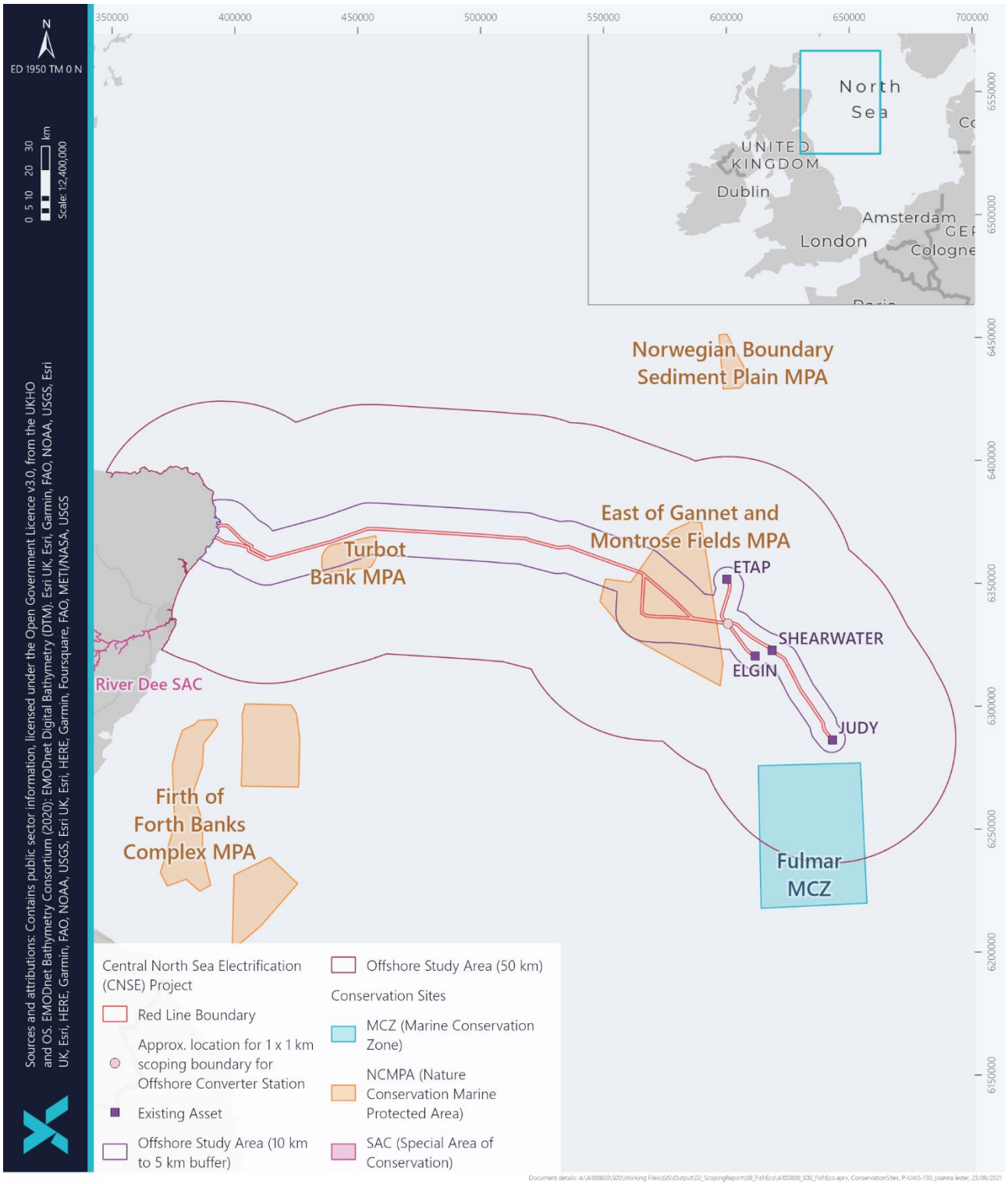

Figure 9-7 Designated sites relevant to fish and/or shellfish receptors within and without the fish and shellfish ecology Study Area

9.6 Embedded Mitigation

At this stage topic-specific measures have not been developed; however, certain measures have been proposed as part of the development process in line with industry best-practice to reduce the potential for impacts to fish and shellfish (Table 9-4). The embedded mitigation specific to fish and shellfish receptors will be agreed upon by the Applicant and will be detailed within the EIAR. Unless otherwise indicated, the mitigation measures will be secured through the ML consent conditions.

Table 9-4 Proposed embedded mitigation measures

Embedded Mitigation	Type (Primary or Tertiary)
Develop and implement a CEMP, including a Marine Pollution Contingency and Control Plan, and an INNS management plan.	Tertiary
Micro-routeing within the Marine Scheme will be carried out to help avoid or minimise interactions with localised engineering and environmental constraints (including avoidance of any identified seabed heritage assets and other features of archaeological significance). This decision making will be informed by CBRA.	Primary
Compliance with MARPOL regulations and best-practise protocols to prevent and manage incidents of accidental release of marine contaminants.	Tertiary
Ballast water discharges from all vessels will be managed under International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM Convention).	Tertiary
All vessels will adhere to the International Maritime Organisation (IMO) guidelines for the control and management of ships' biofouling to minimise the transfer of invasive aquatic species (Biofouling Guidelines) (resolution MEPC.207(62)).	Tertiary
OCS design will seek to minimise the potential for operational discharges	Primary

9.7 Scoping of Impacts

The potential impacts of the Marine Scheme on fish and shellfish receptors have been identified and considered based on professional experience, the PDE, relevant third-party environmental reports (Section 9.4), and are further described in Table 9-2 below

.

Table 9-2 Scoping of potential impacts relating to fish and shellfish ecology receptors

Potential Impact	Scoping Result	Justification	Information Required to Inform the Assessment	Assessment Method
Installation and Decommissioning				
Temporary habitat and species disturbance or loss	Scoped in	Seabed disturbance associated with installation and decommissioning works may negatively impact fish and shellfish species dependent on the seabed for some or all of their life cycle. Potential impacts on herring, sandeel and Norway lobster spawning grounds associated with direct seabed disturbance during OCS and cable installation will be limited to the immediate vicinity of the works. Given the limited potential for significant fish spawning grounds along the offshore cable routes for herring and Norway lobster, is it considered that the potential for significant impacts to these species as a result of Marine Scheme installation and decommissioning works is unlikely. Sandeel spawning intensity is high along the length of the HVDC Cables, with a low intensity within the immediate vicinity of the OCS and Assets. However, given the localised nature and small scale of direct seabed disturbance associated with the Marine Scheme, the potential for significant impacts to occur is unlikely.	Available desktop information to describe the baseline environment. Habitat maps and PSA results from the benthic habitat surveys to understand the potential suitability of the seabed within the fish and shellfish ecology Study Area for herring, sandeel and Norway lobster spawning.	The area of impact will be calculated based on the extent of seabed footprint associated with the PDE.
Temporary increases in SSC and associated sediment deposition and potential release of contaminants	Scoped in	Increased sedimentation associated with installation and decommissioning works may lead to smothering of slow moving or sessile species. Localised changes in sediment type which may also potentially impact seabed dependent species (e.g. herring, sandeel and Norway lobster). While any potential impacts associated with increased SSC and the potential release of contaminants as a result of installation or decommissioning works are anticipated to be highly localised and temporary, it is considered that there are potential pathways with significant impacts on fish and shellfish receptors during installation and decommissioning of the Marine Scheme and this impact is scoped in.	Results from baseline geophysical and/or benthic surveys (further detail in Section 8.4). Estimations of sediment transport pathways from the Physical Environment assessment (Section 6).	The principal method to be employed will be to estimate approximate zones of influences for increased suspended sediments resulting from the installation activities. This will be used to assess the potential magnitude of effect on seabed dependent species.

Potential Impact	Scoping Result	Justification	Information Required to Inform the Assessment	Assessment Method
Underwater noise: vessels, surveys and cable installation (including seabed preparation activities)	Scoped out	Fish species may exhibit behavioural responses when exposed to sound (Popper *et al.*, 2018). Impacts from noise emitting activities typically impact species with swim bladders or other air sac alternatives making these species more susceptible to impacts. Additionally, whilst species may exhibit behavioural responses of avoidance eggs and larvae will be unable to perform this action (Popper et al, 2009). Whilst impacts may occur, they will be localised and temporary and unlikely to result in long-term impacts. Noise arising from vessels has the potential to result in behavioural responses. This has been seen from moving research vessels noting avoidance response (De Robertis, and Handegard, 2013). Further studies were undertaken to determine the impacts from vessel noise, there is potential for anatomy injuries including damage to ears or swim bladders. There is also potential for physiology/stress injuries which can result in health and reproductive issues (Weilgart, 2018). Disturbance to fish populations caused by underwater noise generated during installation may negatively impact diadromous fish and fish spawning behaviour, particularly for sensitive species including cod, whiting, and sandeel (Popper *et al.*, 2014) which all potentially spawn within the fish and shellfish ecology Study Area. However, given the limited number of vessels expected to be involved in any seabed preparation and installation activities and the short duration and localised nature of Marine Scheme installation activities, the potential for significant impacts on fish is considered to be minimal. For the abovementioned reasons, it is considered that there is no potential pathway with significant impacts on fish and shellfish receptors and the potential impact is therefore scoped out.		
Underwater noise: OCS piling	Scoped in	Underwater noise generated during impact piling may negatively impact diadromous and marine fish. These impacts could include mortality or injury in the near field, and sub-lethal effects i.e. disturbance and disruption of vital processes, for example spawning behaviour. These impacts would be greatest for acoustically sensitive species including cod, whiting, and sandeel (Popper *et al.*, 2014) all of which potentially spawn within the fish and shellfish ecology Study Area. While the piling activity will be limited to a single jacket for the OCS, which will require localised, short duration piling activities, the potential for significant impacts on fish is considered to be minimal. Underwater noise impacts from impact piling have been scoped in for further assessment.	Available desktop information to describe the baseline environment and inform assessment of impact. Predicted underwater noise levels for the installation period.	While most sound sources associated with the Marine Scheme would not be likely to have significant impacts on fish and shellfish, sound associated with impact piling (if required) could introduce the risk of injury. This assessment will be based on (where possible) publicly available data from other projects within the marine area, to assess potential sources and anticipated sound levels associated with installation activities of relevance to the Marine Scheme.
Accidental release of pollutants	Scoped out	Accidental releases of pollutants may arise as a result of accidental spills from vessels or other equipment and can potentially have detrimental effects on fish and shellfish. However, the risk and impact of accidental releases of hazardous substances will be reduced through the implementation of the CEMP, including measures for compliance with international requirements of MARPOL, as well as best practice for works in the marine environment (e.g. preparation of Shipboard Oil Pollution Emergency Plans (SOPEP)). Accidental release of potential contaminants from installation vessels will be strictly controlled and procedures will be in place to minimise the potential impact of any accidental release if it occurs. The potential impact has been scoped out of the EIA.		
Operation and Maintenance				
EMF effects from operational cables	Scoped in	Subsea cables emit EMFs along their lengths. EMF may impact sensitive species, including elasmobranchs, teleost fish (i.e. flat fish, salmonids and gadoids) and crustaceans by altering foraging or migratory behaviour (Hutchison *et al.*, 2020). The magnitude of this impact will depend in part on the project design and the burial and cable protection measures which are utilised. Further justification for scoping this impact in for further assessment is presented in Section 9.7.1.	Available desktop information to describe the baseline environment. An EMF modelling study will be commissioned to determine the potential EMF emissions which may result from the operation of the Marine Scheme.	The assessment will consider the EMF emissions based on the PDE. It is acknowledged that there is limited, but emerging research on EMF impacts on fish and shellfish. The impact assessment will draw on the latest relevant available literature on this impact.
Long-term habitat loss and disturbance	Scoped in	Long-term habitat loss and disturbance may occur as a result of the presence of installed OCS and cable, rock protection, and clearing of areas to allow for laying of cables. These activities may lead to a change in the seabed type, potentially altering spawning, nursery and feeding	Available desktop information to describe the baseline environment. Habitat maps and PSA results from the benthic habitat surveys will be used to understand the potential	The area of impact will be calculated based on the seabed footprint associated with the PDE.

Potential Impact	Scoping Result	Justification	Information Required to Inform the Assessment	Assessment Method
		habitat. Species that are seabed dependent for some or all of their life cycle (e.g. sandeel, herring, and Norway lobster) are most sensitive to this impact.	suitability of the seabed at the site for herring, sandeel and Norway lobster spawning.	
Temporary habitat and species disturbance or loss resulting from maintenance operations	Scoped out	Routine maintenance operations will be of short duration and highly localised, as such the associated habitat disturbance/loss do not have the potential to result in significant effects on fish and shellfish receptors, and the potential impacts are therefore scoped out.		
Temporary increases in SSC and associated sediment deposition resulting from maintenance operations	Scoped out	Routine maintenance operations will be of short duration and highly localised, as such the associated increase in in SSC/deposition do not have the potential to result in significant effects on fish and shellfish receptors, and the potential impacts are therefore scoped out.		
Thermal emissions from operational cables	Scoped out	Thermal emissions from cables increase the temperature of the surrounding sediments. Taormina *et al.* (2018) showed a maximum increase of 2.5°C, 50 cm directly below the cable. The Marine Scheme's thermal emissions will be highly localised, the offshore cables will be buried or protected providing separation from fish and shellfish receptors, and the high specific heat capacity of seawater will prevent any significant heating of the marine environment or shallow sediments. As such, no significant impacts are anticipated and the potential impacts are scoped out.		
Accidental release of pollutants	Scoped out	Accidental releases of pollutants may arise as a result of accidental spills from vessels or other equipment and have detrimental effects on fish and shellfish. The risk and impact of accidental releases of hazardous substances will be reduced via the implementation of measures for compliance with MARPOL and SOPEP requirements. Accidental release of potential contaminants from operation and maintenance vessels will be controlled and procedures will be in place to minimise the potential impact of any accidental release if it occurs. The OCS will be unmanned with limited inventory and therefore potential for accidental discharges. The potential impacts are therefore scoped out,		

9.7.1 Scoping Assessment Justification

9.7.1.1 EMF effects from operational cables

Although many studies have found no impact of EMF on teleost fish (Fey *et al.*, 2019, Schultz *et al.*, 2010, Cresci *et al.*, 2020, Cresci *et al.*, 2022), a study reported slight behavioural differences in Atlantic haddock (swimming speed and acceleration reduced) when exposed to EMF of 50 – 150 µT from HVDC cables (Cresci *et al.*, 2022).

Some studies have found minor effects on diadromous species. Effects of EMF were found on the Atlantic salmon, sea trout and rainbow trout (Sadowski 2007), steelhead trout (Putman 2014), brown trout and rainbow trout embryos (Formicki *et al.*, 1997, 2004; Fey 2019). Impacts were also found on the Atlantic lumpfish (Durrif 2023). However, some of the studies used B-field intensities in the range of several millitesla, much higher than the micro- or nanotesla measured in the vicinity of underwater cables (Gill and Desender, 2020). Other studies found no impacts on the European eel *Anguilla anguilla* (Westerberg and Begout-Anras 2000, Westerberg 2008, Orpwood and Fryer 2015), Atlantic salmon (Armstrong 2015), Chinook salmon (Wyman 2018) and green sturgeon (Klimley 2017, 2016), migrating chum salmon (Yano 1997), coho salmon (Schultz 2010), Rainbow trout (Jakubowska 2021) or brown trout *Salmo trutta* (Gill 2012).

The American lobster exhibited a statistically significant but subtle change in behavioural activity when exposed to EMF from a HVDC cable (Hutchison *et al.*, 2018), and an alteration in egg and larval parameters (i.e. carapace height, length, eye diameter) was observed in the European lobster (Harsanyi *et al.* 2022). However, the last study used B-field at much greater strength (millitesla) than expected for an offshore wind farm/ subsea cable (micro- or nanotesla) (Gill and Desender, 2020). No effects were however found on the behaviour of juvenile European lobster (Taormina, 2020).

Studies have shown that elasmobranchs can detect very low E-fields (0.005 µV.cm-1) (Taormina *et al.* 2018), thus it is plausible that they will sense E-fields from cables. Studies have found effects of EMFs on the behavioural movement of the little skate (Hutchison 2018 and 2020), small spotted sharks and captive sandbar sharks (Anderson 2017).

Due to the presence of magneto and electro receptive species in the project area and uncertainties around the potential impacts of EMF on migratory (including diadromous) fish species, effects of EMF on fish has been scoped in to the EIA.

9.8 Potential Cumulative and Transboundary Impacts

Although the predicted impacts of the Marine Scheme are anticipated to be localised, there is the possibility that certain impacts from the Marine Scheme may interact with other projects, plans and activities, which could result in a cumulative effect on fish and shellfish ecology receptors. There is the potential for cumulative offshore fish and shellfish ecology impacts to occur during all phases of the Marine Scheme. The projects to be considered as part of the Cumulative Impact Assessment are summarised in Table 4-3. The assessment will be made based on information in the public domain, and in line with the methodology outlined in Section 4.

There is no potential for transboundary impacts on fish and shellfish ecology receptors to arise as a result of installation, operation and maintenance or decommissioning activities associated with the Marine Scheme. Any

potential impacts associated with the Marine Scheme will be highly localised. Potential transboundary impacts will not be assessed further within the EIA and are therefore proposed to be scoped out of the EIA for the Marine Scheme.

9.9 Proposed EIA Methodology

The assessment of impacts for fish and shellfish ecology will be conducted in line with the overall EIA methodology described in Section 4 and will be in accordance with the relevant legislation, policy, and standard industry and best-practice guidance. The available data to inform the fish and shellfish ecology baseline from a desk-based study is extensive and therefore there will be no requirement to obtain any further data via site-specific fish and shellfish ecology surveys. The fish and shellfish EIA will also adhere to guidance from CIEEM "Guidelines for Ecological Impact Assessment in the UK and Ireland Terrestrial, Freshwater, Coastal, and Marine" (CIEEM, 2022).

Engagement with consultees will be an important source of information for the Marine Scheme. Engagement with fisheries consultees will be undertaken as detailed in Section 12, and relevant District Salmon Fisheries Boards including the Ugie, Ythan, Deveron, Don and Dee will be consulted to inform the assessment.

9.10 Scoping Questions

The Applicant would request responses to the Greenfield scoping questions of relevance to Section 9. Fish and Shellfish Ecology. Please respond to Questions 7-14 in Table 1-2.

9.11 Fish and Shellfish: Brownfield

The baseline description for fish and shellfish receptors (Section 9.5) does not differ between the Brownfield and the Greenfield Scope.

The Brownfield Scope occupies a very small area relative to the total area utilised by fish and shellfish receptors (approximately 4 x 500 m safety zones or less than 0.2% of the area occupied by the Greenfield Scope).

Given the following:

- The activity associated with the Brownfield Scope, i.e. temporary installation vessel activity, installation of limited additional infrastructure (cable, cable protection and up to two BLPs) and infrequent short-term vessel activity associated with O&M
- The highly localised area within which activity will occur
- That the activity will occur within an area of existing infrastructure (established oil and gas assets)

it is concluded that no source-pathway-receptor route exists by which activity associated with the Brownfield Scope could appreciably impact on fish and shellfish receptors. It is therefore proposed that fish and shellfish receptors can be scoped out of further assessment associated with the Brownfield Scope.

Embedded mitigation relevant to fish and shellfish (Section 9.6) will be applied to the activities associated with the Brownfield Scope.

9.11.1 Brownfield Scoping Questions

The Applicant would request responses to the Brownfield scoping questions of relevance to Section 9. Fish and Shellfish Ecology. Please respond to Question 5 in Table 1-3.

9.12 References

Aires, C., González-Irusta, J.M. and Watret, R. (2014). Updating fisheries sensitivity maps in British waters. *Marine Scotland Science*. Available at: https://data.marine.gov.scot/dataset/updating-fisheries-sensitivity-maps-british-waters. [Accessed on: 28 March 2023].

Alessandro Cresci, Caroline M F Durif, Torkel Larsen, Reidun Bjelland, Anne Berit Skiftesvik, Howard I Browman, Magnetic fields produced by subsea high-voltage direct current cables reduce swimming activity of haddock larvae (Melanogrammus aeglefinus), PNAS Nexus, Volume 1, Issue 4, September 2022, pgac175, https://doi.org/10.1093/pnasnexus/pgac175

Anderson, J. M., Clegg, T. M., Véras, L. V., & Holland, K. N. (2017). Insight into shark magnetic field perception from empirical observations. Scientific Reports, 7(1), 11042.

Armstrong, J., McKelvey, S., Smith, G., Rycroft, P., and Fryer, R. (2018). Effects of individual variation in length, condition and run-time on return rates of wild-reared Atlantic salmon Salmo salar smolts. *Journal of Fish Biology*, Vol 92 No 13. Available at: https://onlinelibrary.wiley.com/doi/10.1111/jfb.13548 [Accessed on: 28 March 2023].

Armstrong, J.D. (2015). Behavioural Responses of Atlantic Salmon to Mains Frequency Magnetic Fields. [online] agris.fao.org. Available at: https://agris.fao.org/agris-search/search.do?recordID=QN2019000000304 [Accessed 4 May 2023].

Coull, K.A., Johnstone, R, and Rogers, S.I. (1998). Fisheries Sensitivity Maps in British Waters. UKOOA Ltd: Aberdeen. Available at: https://marine.gov.scot/data/fisheries-sensitivity-maps-british-waters-coull-et-al-1998 [Accessed on: 28 March 2023].

Cresci, A., Perrichon, P., Durif, C.M.F., Sørhus, E., Johnsen, E., Bjelland, R., Larsen, T., Skiftesvik, A.B. and Browman, H.I. (2022). Magnetic fields generated by the DC cables of offshore wind farms have no effect on spatial distribution or swimming behavior of lesser sandeel larvae (Ammodytes marinus). Marine Environmental Research, [online] 176, p.105609. doi:https://doi.org/10.1016/j.marenvres.2022.105609.

De Robertis, A. and Handegard, N.O. (2013). Fish avoidance of research vessels and the efficacy of noise-reduced vessels: a review. *ICES Journal of Marine Science*, 70(1), pp.34-45. Available at: https://academic.oup.com/icesjms/article/70/1/34/661416 [Accessed on: 28 March 2023].

Downie, H., Hanson, N., Smith, G., Middlemas, S., Anderson, J., Tulett, D., and Anderson, H. (2018). Using historictag data to infer the geographic range of salmon river stocks likely to be taken by a coastal fishery. *Marine Scotland Science*. Available at: https://data.marine.gov.scot/dataset/using-historic-tag-data-infer-geographic-range-salmon-river-stocks-likely-be-taken-coastal [Accessed on: 28 March 2023].

Durif, C.M.F., Nyqvist, D., Taormina, B., Shema, S.D., Skiftesvik, A.B., Freytet, F. and Browman, H.I. (2023). Magnetic fields generated by submarine power cables have a negligible effect on the swimming behavior of Atlantic lumpfish (Cyclopterus lumpus) juveniles. PeerJ, [online] 11, p.e14745. doi:https://doi.org/10.7717/peerj.14745.

Ellis, J.R., Milligan, S.P., Readdy, L., Taylor, N. and Brown, M.J. (2012). Spawning and Nursery Grounds of Selected Fish Species in UK Waters. *Sci. Ser. Tech. Rep.*, Cefas Lowestoft, 147: 56 pp. Available at: https://docslib.org/doc/10530704/spawning-and-nursery-grounds-of-selected-fish-species-in-uk-waters [Accessed on: 28 March 2023].

Fey, D.P., Greszkiewicz, M., Otremba, Z. and Andrulewicz, E. (2019). Effect of static magnetic field on the hatching success, growth, mortality, and yolk-sac absorption of larval Northern pike Esox lucius. Science of The Total Environment, [online] 647, pp.1239–1244. doi:https://doi.org/10.1016/j.scitotenv.2018.07.427.

Fey, D.P., Jakubowska, M., Greszkiewicz, M., Andrulewicz, E., Otremba, Z. and Urban-Malinga, B. (2019). Are magnetic and electromagnetic fields of anthropogenic origin potential threats to early life stages of fish? Aquatic Toxicology, 209, pp.150–158. doi:https://doi.org/10.1016/j.aquatox.2019.01.023.

Gill, A.B. and Desender, M. (2020). 2020 State of the Science Report, Chapter 5: Risk to Animals from Electromagnetic Fields Emitted by Electric Cables and Marine Renewable Energy Devices. [online] www.osti.gov. Available at: https://www.osti.gov/biblio/1633088 [Accessed 24 Feb. 2023].

Gill, A.B., Bartlett, M. and Thomsen, F. (2012). Potential interactions between diadromous fishes of U.K. conservation importance and the electromagnetic fields and subsea noise from marine renewable energy developments. Journal of Fish Biology, 81(2), pp.664–695. doi:https://doi.org/10.1111/j.1095-8649.2012.03374.x.

Godfrey, J.D., Stewart, D.C., Middlemas, S.J., and Armstrong, J.D. (2015). Depth Use and Migratory Behaviour of Homing Atlantic Salmon (Salmo salar) in Scottish Coastal Waters. *ICES Journal of Marine Science*. Volume 72. p.568– 575. Available online at: http://icesjms.oxfordjournals.org/content/early/2014/07/16/icesjms.fsu118.full.pdf?keytype=ref&ijkey=y9lmPDRLdC04 n7B [Accessed on: 28 March 2023].

González-Irusta, J.M. and Wright, P. J. (2015). Spawning grounds of Atlantic cod (*Gadus morhua*) in the North Sea. *ICES Journal of Marine Science*. Volume 73 (2), p.304-315. Available online at: https://academic.oup.com/icesjms/article/73/2/304/2614292 [Accessed on: 20 March 2023].

González-Irusta, J.M. and Wright, P. J. (2016). Spawning grounds of haddock (*Melanogrammus aeglefinus*) in the North Sea and West of Scotland. *Fisheries Research*. Volume 183, p.180-191. Available online at: https://www.sciencedirect.com/science/article/abs/pii/S0165783616301771?via%3Dihub [Accessed on: 20 March 2023].

González-Irusta, J.M. and Wright, P. J. (2017). Spawning grounds of whiting (*Merlangius merlangus*). *Fisheries Research*. Volume 195, p.141-151. Available online at: https://www.sciencedirect.com/science/article/abs/pii/S0165783617301790?via%3Dihub [Accessed on: 20 March 2023].

Harsanyi, P., Scott, K., Easton, B. A., de la Cruz Ortiz, G., Chapman, E. C., Piper, A. J., ... & Lyndon, A. R. (2022). The Effects of Anthropogenic Electromagnetic Fields (EMF) on the Early Development of Two Commercially Important Crustaceans, European Lobster, Homarus gammarus (L.) and Edible Crab, Cancer pagurus (L.). Journal of Marine Science and Engineering, 10(5), 564.

Hutchison, Z. L., Gill, A. B., Sigray, P., He, H., & King, J. W. (2020). Anthropogenic electromagnetic fields (EMF) influence the behaviour of bottom-dwelling marine species. Scientific reports, 10(1), 4219.

Hutchison, Z., Sigray, P., He, H., Gill, A. B., King, J., & Gibson, C. (2018). Electromagnetic Field (EMF) impacts on elasmobranch (shark, rays, and skates) and American lobster movement and migration from direct current cables. Sterling (VA): US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM, 3, 2018.

Hutchison, Z.L., Gill, A.B., Sigray, P., He, H. and King, J.W. (2020). Anthropogenic electromagnetic fields (EMF) influence the behaviour of bottom-dwelling marine species. *Scientific reports*, 10(1), pp.1-15. Available at: https://pubmed.ncbi.nlm.nih.gov/32144341/ [Accessed on: 28 March 2023].

Jakubowska, M., Greszkiewicz, M., Fey, D.P., Otremba, Z., Urban-Malinga, B. and Andrulewicz, E. (2021). Effects of magnetic fields related to submarine power cables on the behaviour of larval rainbow trout (Oncorhynchus mykiss). Marine and Freshwater Research, [online] 72(8), pp.1196–1207. doi:https://doi.org/10.1071/MF20236.

JNCC (2023). River Dee, Designated Special Area of Conservation (SAC). Available online at: https://sac.jncc.gov.uk/site/UK0030251 [Accessed on: 14 March 2023].

Klimley, A.P., Wyman, M.T. and Kavet, R. (2016). Assessment of Potential Impact of Electromagnetic Fields from Undersea Cable on Migratory Fish Behavior. [online] www.osti.gov. Available at: https://www.osti.gov/biblio/1406896 [Accessed 4 May 2023].

Klimley, A.P., Wyman, M.T. and Kavet, R. (2017). Chinook salmon and green sturgeon migrate through San Francisco Estuary despite large distortions in the local magnetic field produced by bridges. PLOS ONE, 12(6), p.e0169031. doi:https://doi.org/10.1371/journal.pone.0169031.

Malcolm, I.A, Millar C.P and Millidine K.J. (2015). Spatio-Temporal Variability in Scottish Smolt Emigration Times and Sizes. *Scottish Marine and Freshwater Science*. Volume 6 Number 2. Available online at: http://www.gov.scot/Resource/0047/00472202.pdf. [Accessed on: 15 March 2023].

Malcolm, I.A., Godfrey, J and Youngson, A.F. (2010). Review of Migratory Routes and Behaviour of Atlantic Salmon, Sea Trout and European Eel in Scotland's Coastal Environment: Implications for the Development of Marine Renewables. *Scottish Marine and Freshwater Science*. Vol 1 No 14. Available at:

https://tethys.pnnl.gov/publications/review-migratory-routes-behaviour-atlantic-salmon-sea-trout-european-eel-scotlands [Accessed on: 28 March 2023].

Marine Scotland. (2018). Salmon Smolt Surveying on the Sunbeam. Available online at: https://blogs.gov.scot/marine-scotland/2018/05/11/salmon-smolt-surveys-on-the-sunbeam/. Survey report at: https://www.bodc.ac.uk/resources/inventories/cruise_inventory/programmes/1419h.pdf. [Accessed on: 22 March 2023].

MarLIN. (2023). The Marine Life Information Network. Available online at https://www.marlin.ac.uk/ [Accessed on: 27 March 2023].

MMO (2023, updated). UK Sea Fisheries Statistics 2021. Available online at: https://www.gov.uk/government/statistics/uk-sea-fisheries-annual-statistics-report-2021 [Accessed on: 21 March 2023].

Newton, M., Main, R. and Adams, C. (2017). Atlantic Salmon Salmo salar Smolt Movements in the Cromarty and Moray Firths, Scotland. LF000005-REP-1854, March 2017. Available at: https://marine.gov.scot/data/mfrag-main-group-beatrice-offshore-windfarm-atlantic-salmon-salmo-salar-smolt-movements-survey [Accessed on: 28 March 2023].

Orpwood, J., Fryer, R.J., Rycroft, P. and Armstrong, J.D. (2015). Effects of AC magnetic fields (MFs) on swimming activity in European eels Anguilla anguilla. [online] research-scotland.ac.uk. Available at: https://research-scotland.ac.uk/handle/20.500.12594/11164 [Accessed 4 May 2023].

Popper A N, Hawkins A D, Fay R, Mann D A, Bartol S, Carlson T J, Coombs S, Ellison W T, Gentry R L, Halvorsen M B, Løkkeborg S, Rogers P H, Southall B L, Zeddies D G, Tavolga W N. (2014). Sound Exposure Guidelines for Fishes and Sea Turtles. *Springer Briefs in Oceanography*, DOI 10. 1007/978-3-319-06659-2. Available at: https://link.springer.com/book/10.1007/978-3-319-06659-2

Popper, A.N. and Hawkins, A.D. (2018). A sound approach to assessing the impact of underwater noise on marine fishes and invertebrates. *ICES Journal of Marine Science*, 74(3), pp.635-651. Available at: https://www.researchgate.net/publication/311947519_Hawkins_A_D_and_Popper_A_N_2017_A_sound_approach_to_assessing_the_impact_of_underwater_noise_on_marine_fishes_and_invertebrates_-_ICES_Journal_of_Marine_Science_doi101093icesjmsfsw205 [Accessed on: 28 March 2023].

Popper, A.N., Hastings, M.C. (2009). The effects of anthropogenic sources of sound on fishes. Available online at: https://onlinelibrary.wiley.com/doi/10.1111/j.1095-8649.2009.02319.x [Accessed on: 28 March 2023].

Putman, N.F., Meinke, A.M. and Noakes, D.L.G. (2014). Rearing in a distorted magnetic field disrupts the 'map sense' of juvenile steelhead trout. Biology Letters, 10(6), p.20140169. doi:https://doi.org/10.1098/rsbl.2014.0169.

Sadowski, M., Winnicki, A., Formicki, K., Sobociński, A., & Tański, A. (2007). The effect of magnetic field on permeability of egg shells of salmonid fishes. Acta Ichthyologica et Piscatoria, 37(2), 129-135.

Schultz, I.R., Woodruff, D.L., Marshall, K.E., Pratt, W.J. and Roesijadi, G. (2010). Effects of Electromagnetic Fields on Fish and Invertebrates. [online] www.osti.gov. Available at: https://www.osti.gov/biblio/1012305 [Accessed 4 May 2023].

Taormina, B., Bald, J., Want, A., Thouzeau, G., Lejart, M., Desroy, N., and Carlier, A. (2018). A review of potential impacts of submarine power cables on the marine environment: Knowledge gaps, recommendations and future directions. *Renewable and Sustainable Energy Reviews*, Vol 96, pp. 380-391. Available at: https://researchportal.hw.ac.uk/en/publications/a-review-of-potential-impacts-of-submarine-power-cables-on-the-ma [Accessed on: 28 March 2023].

Taormina, B., Bald, J., Want, A., Thouzeau, G., Lejart, M., Desroy, N., & Carlier, A. (2018). A review of potential impacts of submarine power cables on the marine environment: Knowledge gaps, recommendations and future directions. Renewable and Sustainable Energy Reviews, 96, 380-391.

Taormina, B., Di Poi, C., Agnalt, A. L., Carlier, A., Desroy, N., Escobar-Lux, R. H., ... & Durif, C. M. (2020). Impact of magnetic fields generated by AC/DC submarine power cables on the behavior of juvenile European lobster (Homarus gammarus). Aquatic Toxicology, 220, 105401.

Tyler-Walters, H., James, B., Carruthers, M. (eds.), Wilding, C., Durkin, O., Lacey, C., Philpott, E., Adams, L., Chaniotis, P.D., Wilkes, P.T.V., Seeley, R., Neilly, M., Dargie, J. & Crawford-Avis, O.T. 2016. Descriptions of Scottish Priority Marine Features (PMFs). *Scottish Natural Heritage Commissioned Report No. 406*. Available at: https://www.semanticscholar.org/paper/Descriptions-of-Scottish-Priority-Marine-Features-Tyler-Walters-James/f6c1cea31d397c23c2103bf2fccdc38255033b60 [Accessed on: 28 March 2023].

Weilgart, L. (2018). The Impact of Ocean Noise Pollution on Fish and Invertebrates. *Report for OceanCare*. Available at: https://tethys.pnnl.gov/publications/impact-ocean-noise-pollution-fish-invertebrates [Accessed on: 28 March 2023].

WESTERBERG, H. and LAGENFELT, I. (2008). Sub-sea power cables and the migration behaviour of the European eel. Fisheries Management and Ecology, 15(5-6), pp.369–375. doi:https://doi.org/10.1111/j.1365-2400.2008.00630.x.

Westerberg, H., & Begout-Anras, M. L. (2000). Orientation of silver eel (Anguilla anguilla) in a disturbed geomagnetic field. Advances in fish telemetry, 149-158.

Wyman, M.T., Peter Klimley, A., Battleson, R.D., Agosta, T.V., Chapman, E.D., Haverkamp, P.J., Pagel, M.D. and Kavet, R. (2018). Behavioral responses by migrating juvenile salmonids to a subsea high-voltage DC power cable. Marine Biology, 165(8). doi:https://doi.org/10.1007/s00227-018-3385-0.

Yano, A., Ogura, M., Sato, A., Sakaki, Y., Shimizu, Y., Baba, N. and Nagasawa, K. (1997). Effect of modified magnetic field on the ocean migration of maturing chum salmon, Oncorhynchus keta. Marine Biology, 129(3), pp.523–530. doi:https://doi.org/10.1007/s002270050193.

10 ORNITHOLOGY

10.1 Introduction

This section of the Scoping Report identifies the offshore and intertidal ornithological receptors of relevance to the Marine Scheme. It considers the potential impacts of the Marine Scheme on birds during the installation, operation and maintenance, and decommissioning phases of the Marine Scheme.

The offshore and intertidal ornithological receptors considered within this section include key seabird species, terrestrial migratory birds, and the surrounding designated sites of ornithological relevance.

This section of the Scoping Report should be read in conjunction with the following sections:

- Section 7 Benthic Ecology; and
- Section 9 Fish and Shellfish Ecology.

The Onshore Scheme Scoping Report (Terrestrial Ecology and Ornithology) will provide concomitant assessment of the ornithological receptors of relevance to the Onshore Scheme.

10.2 Legislation, Policy and Guidance

In addition to the relevant policy and legislation described in Section 2, the following section outlines the legislation, policy and guidance that will be taken into consideration in relation to the ornithology EIA.

10.2.1 International Legislation and Policy

- Convention for the Protection of the Marine Environment of the North-East Atlantic (the 'OSPAR Convention') adopted in 1998 and amended in 2007.

10.2.2 National Legislation

UK

- The Wildlife and Countryside Act 1981.

Scotland

- Nature Conservation (Scotland) Act 2004.
- Wildlife and Natural Environment (Scotland) Act 2011; and
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended).

10.2.3 National Policy

UK

- UK Post 2010 Biodiversity Framework (JNCC & DEFRA, 2012).

Scotland

- Scotland's Biodiversity: a route map to 2020 (Scottish Government, 2015).

10.2.4 Guidance

- Chartered Institute for Ecology and Environmental Management (CIEEM) (2018): Guidelines for Ecological Impact Assessment in Britain and Ireland – Terrestrial, Freshwater, Coastal and Marine;
- NatureScot (2020): Seasonal Periods for Birds in the Scottish Marine Environment;
- NatureScot (2023): Advice on Marine Renewables Development: Birds guidance (Guidance Notes 1 to 11);
- Scottish Natural Heritage (NatureScot) (2014): Recommendations for the Presentation and Content of Interim Marine Bird, Mammal, and Basking Shark Survey Reports for Marine Renewable Energy Development; and
- Scottish Natural Heritage (NatureScot) (2018): A handbook on environmental impact assessment Guidance for Competent Authorities, Consultees and others involved in the Environmental Impact Assessment Process in Scotland (Version 5; April 2018).

In addition to these guidance notes the results from past, current, and ongoing research projects from ScotMer[15], Offshore Wind Strategic Monitoring and Research Forum (OWSMRF)[16], and Offshore Renewables Joint Industry Programme (ORJIP)[17] will be utilised where appropriate.

10.3 Study Area

The primary ornithology Study Area considers a 10 km buffer around the Marine Scheme, considered appropriate for consideration of potential impacts of the Marine Scheme on seabirds (as informed by professional judgement and prior experience of analogous projects).

The secondary (regional) ornithology Study Area considers a 100 km radius around the Marine Scheme (Figure 10-1) to incorporate designated sites, encompassing potential linkages with species which may transit through the Marine Scheme waters. While it is acknowledged that some species may forage beyond 100 km and therefore there is potential for connectivity with designated sites beyond 100 km, potential impacts from the Marine Scheme are unlikely to be significant at this range and a 100 km search area is considered proportionate. These Study Areas capture land adjacent to the Marine Scheme (landfall) which may support bird populations.

In accordance with Annex I of the EU Birds Directive, SPAs have been implemented into the UK national site network (Section 2.5) for the protection of threatened migratory birds, including seabirds and wintering/migratory waterfowl

[15] *https://www.gov.scot/policies/marine-renewable-energy/science-and-research/*
[16] *https://jncc.gov.uk/our-work/owsmrf/*
[17] *http://www.orjip.org.uk/*

species as qualifying features at these designated sites. A desk-based study has been undertaken to identify the SPAs within the ornithology (regional) Study Area with potential connectivity to the Marine Scheme during the breeding and non-breeding seasons (see Section 10.5.1) (Figure 10-1).

A separate HRA Screening Report will include the detail of SPAs considered within the EIA.

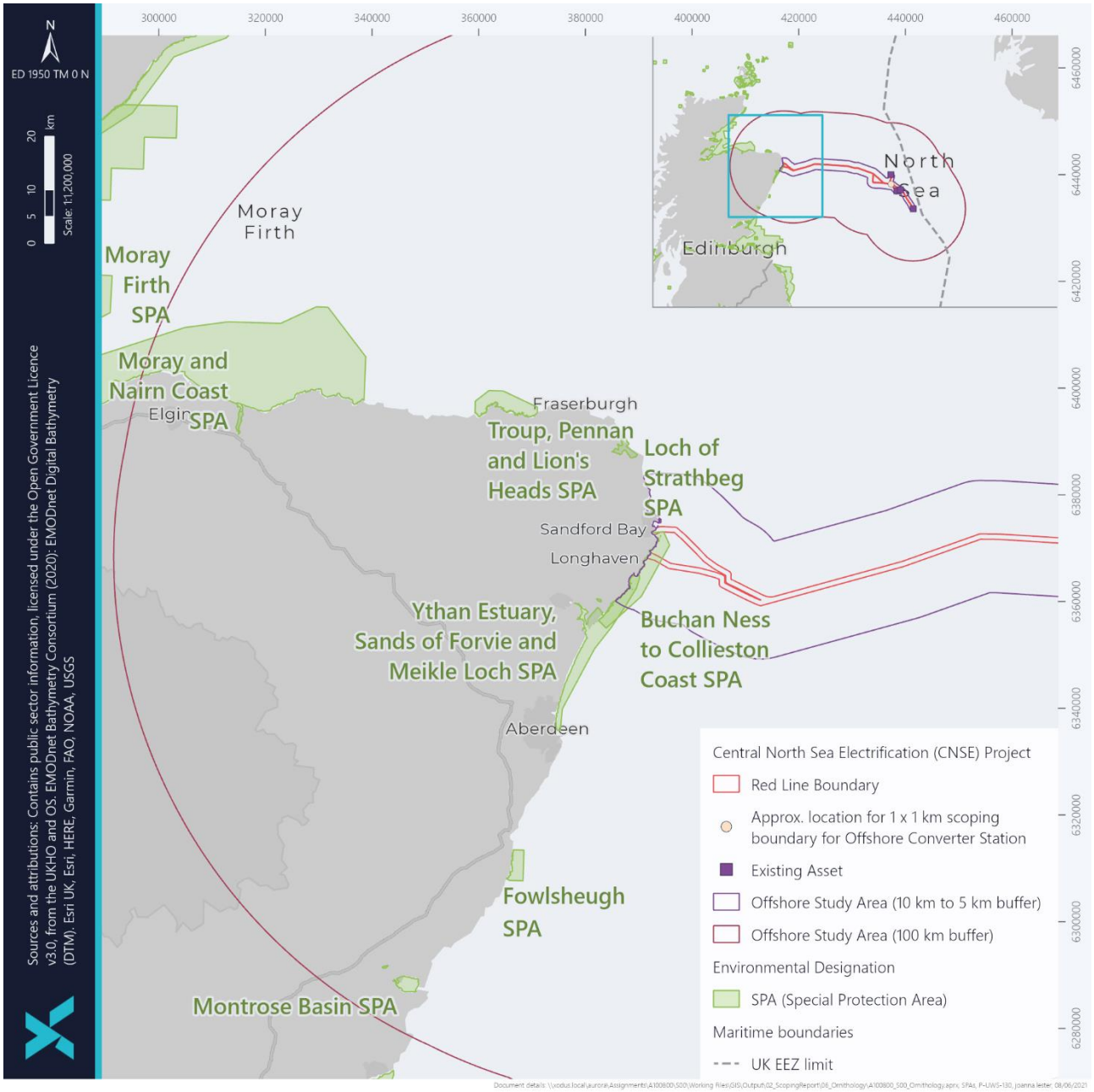

Figure 10-1 The SPAs within the ornithology Study Area

10.4 Key Data Sources

The existing data sets and literature with relevant coverage to the Marine Scheme which have been used to inform this Scoping Report and are proposed to inform the baseline characterisation for the EIA are outlined in Table 10-1.

Table 10-1 Data sources for the offshore and intertidal ornithological assessment

Name of Source	Description/ Link	Author	Date
An Atlas of Seabird Distribution in North-West European Waters	https://data.jncc.gov.uk/data/c132752f-827c-41fc-b617-e681db21eaf5/atlas-of-seabird-distribution-north-west-european-waters.pdf	Stone *et al.*,	1995
The Migration Atlas: Movements of the Birds of Britain and Ireland	https://www.bto.org/our-science/publications/bto-books-and-guides/migration-atlas-movements-birds-britain-and-ireland	Wernham *et al.*,	2002
Aerial surveys of UK inshore areas for wintering sea duck, divers and grebes: 2000/01 and 2001/02	https://data.jncc.gov.uk/data/c425cd96-38e3-4fce-999e-cfb3544605e6/JNCC-Report-333-FINAL-WEB.pdf	Dean *et al.*,	2003
Seabird populations of Britain and Ireland: results of the Seabird 2000 census	https://hub.jncc.gov.uk/assets/1dae7357-350c-483f-b14d-7513254433a5	Mitchell *et al.*,	2004
Surveillance of wintering sea ducks, divers and grebes in UK inshore areas: Aerial surveys and shore-based counts 2005/06	https://data.jncc.gov.uk/data/ed642c15-e8df-4c5b-a878-0148f9cdd144/JNCC-Report-392-FINAL-WEB.pdf	Söhle *et al.*,	2006
An analysis of the numbers and distribution of seabirds within the British Fishery Limit aimed at identifying areas that qualify as possible marine SPAs	https://data.jncc.gov.uk/data/7db38547-5074-4136-8973-fd7d97666120/JNCC-Report-431-Full-FINAL-WEB.pdf	Kober *et al.*,	2010
Assessing vulnerability of marine bird populations to offshore wind farms	https://doi.org/10.1016/j.jenvman.2013.01.025	Furness & Wade	2013
BirdLife International Seabird Tracking Database	https://www.seabirdtracking.org/	BirdLife International	2014
Mapping Seabird Sensitivity to Offshore Wind Farms	https://doi.org/10.1371/journal.pone.0106366	Bradbury *et al.*,	2014
Non-breeding season populations of seabirds in UK	http://publications.naturalengland.org.uk/publication/6427568802627584	Furness	2015

Name of Source	Description/ Link	Author	Date
waters: Population sizes for Biologically Defined Minimum Population Scales. Natural England Commissioned Reports Number 164			
Future of the Atlantic Marine Environment & Seabird Tracking and Research seabird (kittiwakes, guillemots, razorbills and shags) tracking projects	https://marine.gov.scot/information/fame-star-seabird-kittiwakes-guillemots-razorbills-and-shags-tracking-projects	Royal Society for the Protection of Birds (RSPB)	2015
Breeding density, fine-scale tracking, and large-scale modelling reveal the regional distribution of four seabird species	https://doi.org/10.1002/eap.1591	Wakefield *et al.*,	2017
Combining habitat modelling and hotspot analysis to reveal the location of high density seabird areas across the UK: Technical Report	https://www.rspb.org.uk/globalassets/downloads/documents/conservation-science/cleasby_owen_wilson_bolton_2018.pdf	Cleasby *et al.*,	2018
Waterbirds in the UK 2016/17: The annual report of the Wetland Bird Survey	https://www.bto.org/sites/default/files/publications/wituk-2016-17.pdf	Frost *et al.*,	2018
Common Guillemot UK and Eire 95% Utilisation Distributions in 5% Bands	https://opendata-rspb.opendata.arcgis.com/datasets/RSPB::common-guillemot-uk-and-eire-95-utilisation-distributions-in-5-bands/explore?location=56.080209%2C-1.476091%2C6.11	RSPB	2018
Workshop Report on Gull foraging offshore and onshore: developing apportioning approaches to casework	https://www.nature.scot/sites/default/files/2019-08/Gull%20Workshop%20Report%20-%20August%202019.pdf	Quinn, L.R.	2019
A Population Viability Analysis Modelling Tool for Seabird Species	http://publications.naturalengland.org.uk/publication/4926995073073152	Searle *et al.*,	2019
Distribution maps of cetacean and seabird populations in the North-East Atlantic	https://doi.org/10.1111/1365-2664.13525	Waggitt *et al.*,	2019

Name of Source	Description/ Link	Author	Date
Desk-based revision of seabird foraging ranges used for HRA screening, Report of work carried out by the British Trust for Ornithology on behalf of NIRAS and The Crown Estate	https://www.gov.scot/publications/sectoral-marine-plan-appropriate-assessment/pages/8/	Woodward *et al.*,	2019
Identifying important at-sea areas for seabirds using species distribution models and hotspot mapping	https://doi.org/10.1016/j.biocon.2019.108375	Cleasby *et al.*,	2020
Seasonal periods for birds in the Scottish marine environment	https://www.nature.scot/sites/default/files/2020-10/Guidance%20note%20-%20Seasonal%20definitions%20for%20birds%20in%20the%20Scottish%20Marine%20Environment.pdf	NatureScot	2020
SPAs with marine components	https://jncc.gov.uk/our-work/spas-with-marine-components/	JNCC	2020
Additional analysis to inform SNCB recommendations regarding collision risk modelling	https://www.bto.org/sites/default/files/publications/bto_rr_739_cook_collision_risk_models_final_web.pdf	Cook, A.S.C.P.	2021
Seabird Monitoring Programme Report 1986 – 2019	https://jncc.gov.uk/our-work/smp-report-1986-2019/	JNCC	2021
Wetland Bird Surveys (WeBs)	https://www.bto.org/our-science/projects/wetland-bird-survey	British Trust for Ornithology (BTO)	2023
SiteLink web map	https://sitelink.nature.scot/map	NatureScot	2023

10.5 Baseline Environment

This section provides information on the offshore and intertidal ornithological receptors across the ornithology Study Area. The description of the baseline environment for offshore ornithological receptors has been informed by a desk-based review of the most up to date available data sources and literature (Table 10-1).

10.5.1 Designated Sites

The SPAs within the ornithology Study Area (Figure 10-1) are presented within Table 10-2, with detail of their proximity to the Marine Scheme and the qualifying features (breeding and non-breeding) present at the site.

Table 10-2 SPAs within the ornithology Study Area and their qualifying features (NatureScot, 2023)

Site	Proximity	Qualifying Features
Buchan Ness and Collieston Coast SPA	0 km	Breeding • Black-legged kittiwake (*Rissa tridactyla*); • Common guillemot (*Uria aalge*); • European shag (*Phalacrocorax aristotelis*); • Herring gull (*Larus argentatus*); • Northern fulmar (*Fulmarus glacialis*); and • Seabird assemblage.
Ythan Estuary, Sands of Forvie and Meikle Loch SPA	~ 2.7 km	Breeding • Common tern (*Sterna hirundo*); • Little tern (*Sternula albifrons*); and • Sandwich tern (*Sterna sandvicensis*). Non-Breeding • Eider (*Somateria mollissima*); • Lapwing (*Vanellus vanellus*); • Pink-footed goose (*Anser brachyrhynchus*); • Redshank (*Tringa totanus*); and • Waterfowl assemblage.
Loch of Strathbeg SPA	~ 14.4 km	Breeding • Sandwich tern (*Sterna sandvicensis*). Non-Breeding • Goldeneye (*Bucephala clangula*); • Greylag goose (*Anser anser*); • Pink-footed goose (*Anser brachyrhynchus*); • Barnacle goose (*Branta leucopsis*); • Teal (*Anas crecca*); • Whooper swan (*Cygnus cygnus*); and • Waterfowl assemblage.
Troup, Pennan and Lion's Head SPA	~ 30.9 km	Breeding • Black-legged kittiwake (*Rissa tridactyla*); • Common guillemot (*Uria aalge*); • Herring gull (*Larus argentatus*); • Northern fulmar (*Fulmarus glacialis*); • Razorbill (*Alca torda*); and • Seabird assemblage.
Fowlsheugh SPA	~ 58.4 km	Breeding • Black-legged kittiwake (*Rissa tridactyla*); • Common guillemot (*Uria aalge*); • Herring gull (*Larus argentatus*); • Northern fulmar (*Fulmarus glacialis*); • Razorbill (*Alca torda*); and • Seabird assemblage.
Moray Firth SPA	~ 59.3 km	Breeding

Site	Proximity	Qualifying Features
		• European shag (*Phalacrocorax aristotelis*). Non-Breeding • Common scoter (*Melanitta nigra*); • Eider (*Somateria mollissima*); • Goldeneye (*Bucephala clangula*); • Great northern diver (*Gavia immer*); • Long-tailed duck (*Clangula hyemalis*); • Red-breasted merganser (*Mergus serrator*); • Red-throated diver (*Gavia stellata*); • Scaup (*Aythya marila*); • European shag (*Phalacrocorax aristotelis*); • Slavonian grebe (*Podiceps auritus*); and • Velvet scoter (*Melanitta fusca*).
Moray and Nairn Coast SPA	~ 79.4 km	Breeding • Osprey (*Pandion haliaetus*). Non-Breeding • Bar-tailed godwit (*Limosa lapponica*); • Dunlin (*Calidris alpina alpina*); • Greylag goose (*Anser anser*); • Oystercatcher (*Haematopus ostralegus*); • Pink-footed goose (*Anser brachyrhynchus*); • Red-breasted merganser (*Mergus serrator*); • Redshank (*Tringa totanus*); • Wigeon (*Anas penelope*); and • Waterfowl assemblage.
Montrose Basin	~ 88.9 km	Non-Breeding • Dunlin (*Calidris alpina alpina*); • Eider (*Somateria mollissima*); • Greylag goose (*Anser anser*); • Knot (*Calidris canutus*); • Oystercatcher (*Haematopus ostralegus*); • Pink-footed goose (*Anser brachyrhynchus*); • Redshank (*Tringa totanus*); • Shelduck (*Tadorna tadorna*); • Wigeon (*Anas penelope*); and • Waterfowl assemblage.

10.5.2 Potential Species of Interest

The North Sea and the surrounding UK coastline provide breeding and foraging habitat for the 25 species of seabird that regularly breed in the UK and Ireland, as well as several waterbird species. Waterbirds, including sea ducks, divers, herons waders, geese and swans, are prominent in estuarine, coastal, and marine habitats, with resident, migratory, and over-wintering populations (BEIS, 2022).

10.5.2.1 Seabirds

A list of the potential seabird species likely to occur in the ornithology Study Area has been derived from the qualifying features of the SPAs present within the ornithology Study Area (Table 10-2) and is provided in Table 10-3. The recommended foraging ranges[18] for these species are provided in the NatureScot (2023) ornithology guidance (Guidance Note 3) based on Woodward *et al.*, (2019), and the breeding season is based on the suggested seasonal definitions for birds in the marine environment (NatureScot, 2020).

The most recent results from the Seabird Monitoring Programme (SMP) have been used to understand the population trend of the seabirds within the ornithology Study Area (Table 10-3). The SMP is an ongoing annual monitoring scheme for the 25 species of seabirds that breed regularly in the UK and Ireland. The most recent results from the survey were published in 2021 covering data collected from 1986 to 2019 (JNCC, 2021). Prior to July 2022 the SMP was coordinated by JNCC; however, this programme is now coordinated by the British Trust for Ornithology (BTO).

Table 10-3 Seabird species likely to occur in the ornithology Study Area based on the qualifying features of the SPAs present in the vicinity of the Marine Scheme (Table 10-2), and their breeding season (NatureScot, 2020), breeding season foraging range (NatureScot, 2023; Woodward et al., 2019), and population change (%) 2000 – 2019 (JNCC, 2021).

Seabirds			
Species	**Breeding season**	**Foraging range (km)**	**Population change (%) 2000 - 2019**
Common tern	May – September	26.9	-3
European shag	March – September	23.7	-40
Northern fulmar	April – September	1200.2	-33
Common guillemot	April – August	95.2	+60
Herring gull	April – August	85.6	n/a
Black-legged kittiwake	April – August	300.6	-29
Little tern	May – August	5	-28
Razorbill	April – August	122.2	+37
Sandwich tern	April – September	57.5	+5

10.5.2.2 Waterbirds

A list of the potential waterbird species likely to occur in the ornithology Study Area has been derived from the qualifying features of the SPAs present within the ornithology Study Area (Table 10-2) and is provided in Table 10-4. The wintering (non-breeding) season provided is based on the suggested seasonal definitions for birds in the marine

[18] *It is acknowledged that the recommended foraging ranges are accompanied by the metrics for use in determining connectivity; however, these are excluded from Table 10-3 as connectivity of SPAs with the Marine Scheme is detailed in the HRA Screening Report.*

environment (NatureScot, 2020). The Wetlands Bird Survey (WeBs) monitors the non-breeding waterbirds in the UK and provides details on the trends in abundance and distribution of waterbird populations throughout the UK. The most recent report was published in 2021 covering 2019/2020 (Frost *et al.*, 2021).

Table 10-4 Waterbird species likely to occur in the ornithology Study Area based on the qualifying features of the SPAs present in the vicinity of the Marine Scheme (Table 10-2), and their wintering (non-breeding) season (NatureScot, 2020), and population change 2008/09 – 2018/19 in Scotland (Frost et al., 2021).

Waterbirds		
Species	**Wintering (non-breeding) season**	**Population change (%) 2008/09 – 2018/19**
Bar-tailed godwit	n/a	-16
Common scoter	June – April	n/a
Dunlin	n/a	+26
Eider	September – April	-23
Goldeneye	September – April	+4
Great northern diver	October – May	n/a
Greylag goose	n/a	+50
Knot	n/a	+6
Lapwing	n/a	-24
Long-tailed duck	September – April	n/a
Osprey	n/a	n/a
Oystercatcher	n/a	-16
Pink-footed goose	n/a	+61
Red-breasted merganser	August – March	-7
Redshank	n/a	+3
Red-throated diver	September – March	n/a
Scaup	September – March	-26
Shelduck	September – February	+10
Slavonian grebe	September – April	n/a
Barnacle goose	n/a	+32
Teal	n/a	+26
Velvet scoter	September – April	n/a
Whooper swan	n/a	+24
Wigeon	n/a	+2

10.6 Embedded Mitigation

At this stage topic-specific measures have not been developed; however, certain measures have been proposed as part of the development process in line with industry best-practice to reduce the potential for impacts to ornithology receptors (Table 10-5). The embedded mitigation specific to ornithology receptors will be agreed upon by the Applicant and will be detailed within the EIAR. Unless otherwise indicated, the mitigation measures will be secured through the ML consent conditions.

Table 10-5 Proposed embedded mitigation measures

Embedded Mitigation	Type (Primary or Tertiary)
Develop and implement a CEMP, including a Marine Pollution Contingency and Control Plan, and an INNS management plan.	Tertiary
Compliance with International Convention for the Prevention of Pollution from Ships (MARPOL) regulations and best-practise protocols to prevent and manage incidents of accidental release of marine contaminants.	Tertiary

10.7 Scoping of Impacts

The potential impacts of the Marine Scheme on offshore and intertidal ornithological receptors have been identified and considered based on professional experience, the PDE, relevant third-party environmental reports (Section 10.4), and are further described in Table 10-6 below.

Table 10-6 Scoping of potential impacts relating to offshore and intertidal ornithological receptors

Potential Impact	Scoping Result	Justification	Information Required to Inform the Assessment	Assessment Method
Installation and Decommissioning				
Disturbance and/or displacement from installation and decommissioning activities	Scoped in	There is the potential for temporary disturbance to bird species using marine and intertidal habitats during the installation and decommissioning phases of the Marine Scheme because of the presence of infrastructure (cables and OCS) and vessel activity. The potential for the physical presence of infrastructure installation and decommissioning vessels to generate a disturbance and/or displacement response in offshore and intertidal ornithological receptors is considered negligible given the levels of shipping activity which characterise the existing baseline, the single OCS and the addition of a small number of vessels during the installation and decommissioning phase of the Marine Scheme; however, further assessment is required to determine the significance of the impact of overall activity.	Available desktop information to describe the baseline environment and inform assessment of impact.	A semi-qualitative, evidence-based assessment will be undertaken to consider the potential impact of the overall installation and decommissioning activities and identify any additional (secondary) mitigation or monitoring requirements. An HRA Report to Inform Appropriate Assessment (RIAA) will be undertaken to assess the effects on the SPAs.
Disturbance to prey species and habitats of prey species through increases in SSC / localised deterioration in water quality	Scoped in	Increased sedimentation associated with installation and decommissioning works may lead to displacement of birds because of the disturbance to the distribution of prey species through habitat loss and increases to sediment deposition. Localised changes in sediment type which may also potentially impact seabed dependent prey species (e.g. sandeel). Potential impacts associated with increased SSC and/or deterioration in water quality because of installation or decommissioning works are anticipated to be highly localised and temporary, and therefore no significant impacts are anticipated. Nonetheless, further assessment is required.	The assessment will be informed by the outcomes of the Physical Environment assessment, the Fish and Shellfish Ecology assessment, the assessment of increased SSC and the outputs from the analysis of benthic surveys.	The principal method to be employed will be careful examination of the findings of the project specific geophysical and benthic surveys. This will provide site specific information on seabed sediment characteristics and seabed dependent species. The assessment will be informed by the result of the increased SSC assessment undertaken for the Benthic Ecology assessment to assess how this might affect prey species. An HRA RIAA will be undertaken to assess the effects on the SPAs.
Accidental release of pollutants	Scoped out	Accidental releases of pollutants may arise as a result of accidental spills from vessels or other equipment and have detrimental effects on ornithological receptors; however, the risk and impact of accidental releases of hazardous substances will be reduced through the implementation of the CEMP, including measures for compliance with international requirements of MARPOL, as well as best practice for works in the marine environment (e.g. preparation of SOPEPs). In this manner, accidental release of potential contaminants from installation and decommissioning vessels will be strictly controlled and procedures will be in place to minimise the potential impact of any accidental release if it occurs, and hence the potential impact has been scoped out.		
Operation and Maintenance				
Long-term habitat change, including the potential for change in foraging opportunities	Scoped out	During the operation and maintenance phase of the Marine Scheme, there is no potential for long-term habitat changes at the lower trophic levels to result in significant changes in foraging opportunities for offshore and intertidal ornithological receptors. The preferred method of cable protection is cable burial and the seabed footprint of the OCS is very limited. The potential impact has been scoped out.		
Disturbance and/or displacement due to the presence of infrastructure and/or maintenance vessels	Scoped out	During the operation and maintenance phase of the Marine Scheme, there is no potential risk of displacement of seabirds throughout the Marine Scheme. There are not anticipated to be any potential impacts associated with project specific vessels used during maintenance works, any impact would be temporary and highly localised. The addition of a single static structure, the OCS is not anticipated to be associated with any potential impacts on offshore and intertidal ornithological receptors: the OCS will be located over 200 km offshore and will not therefore cause significant impacts to coastal colonies. The potential impact has been scoped out.		
Accidental release of pollutants	Scoped out	Accidental releases of pollutants may arise because of accidental spills from vessels or other equipment and have detrimental effects on offshore and intertidal ornithological receptors; however, the risk and impact of accidental releases of hazardous substances will be reduced through the implementation of the embedded mitigation measures described above. Accidental release of potential contaminants will be controlled and procedures will be in place to minimise the potential impact of any accidental release if it occurs. The potential impact has been scoped out.		

10.8 Potential Cumulative and Transboundary Impacts

Given the proximity of other offshore developments around the Marine Scheme there is potential for cumulative impacts on offshore and intertidal ornithological receptors, especially during the installation phase of the Marine Scheme. The projects to be considered as part of the Cumulative Impact Assessment are summarised in Table 4-3. The assessment will be made based on information in the public domain, and in line with the methodology outlined in Section 4.

The migratory nature of birds presents the possibility of overlap with national and international boundaries. Existing published information on foraging ranges will be used to determine transboundary connectivity. However, as any works associated with the installation, operation and maintenance and decommissioning of the Marine Scheme are anticipated to result in temporary, highly localised (potential) impacts, the potential for transboundary impacts are also anticipated to be temporary and highly localised.

10.9 Proposed EIA Methodology

The EIA methodology for assessing offshore and intertidal ornithological receptors will align with the overall EIA methodology described in Section 4 and will be in accordance with the relevant legislation, policy, and standard industry and best-practice guidance.

The baseline for offshore and intertidal ornithological receptors will be informed by publicly available data and literature described in Section 10.4. Identification of potential impacts from the Marine Scheme on offshore and intertidal ornithological receptors will be informed by expert judgement and consultation with key stakeholders (including but not limited to MD-LOT, NatureScot, JNCC and RSPB), and consultation will be ongoing throughout the EIA process. The potential impacts from the Marine Scheme on offshore and intertidal ornithological receptors will then be assessed based on sensitivity and magnitude criteria on a scale of 'high, medium, low, or negligible.' For offshore and intertidal ornithological receptors, the sensitivity of the receptor is likely to be based on the value of the receptor (*e.g.*, endangered/threatened species and consideration of international protection through the designation of SPAs) and the tolerance of the species to accommodate a particular effect. The magnitude will consider factors such as the duration, scale, frequency, extent, and reversibility of the effect. The exact sensitivity and magnitude criteria will be outlined in the technical report.

The significance of the potential effects will be evaluated using the significance of effects matrix as described in Section 4. The Marine Scheme will include designed in measures as detailed in Section 10.6 and designed in measures will continue to develop alongside the Marine Scheme as required. Where significant effects are identified in the EIA and not mitigated through designed in measures, secondary mitigation and/or monitoring requirements will be established. A cumulative effects assessment will be carried out as detailed in Section 4.2.3 using publicly available data regarding other developments within the vicinity of the Marine Scheme with the potential to amplify the disturbance to offshore and intertidal ornithological receptors.

As described in Section 2.5, an HRA will be carried out alongside the EIA to identify whether there is potential for there to be a LSE on the integrity of the designated sites with ornithological qualifying features (e.g., SPAs) identified in Section 10.5.1.

10.10 Scoping Questions

The Applicant would request responses to the Greenfield scoping questions of relevance to Section 10. Ornithology. Please respond to Questions 7-14 in Table 1-2.

10.11 Ornithology: Brownfield

The baseline description for offshore ornithology receptors (Section 10.5) does not differ between the Brownfield and the Greenfield Scope.

The Brownfield Scope occupies a very small area relative to the total area utilised by offshore ornithology receptors (approximately 4 x 500 m safety zones or less than 0.2% of the area occupied by the Greenfield Scope).

Given the following:

- The activity associated with the Brownfield Scope, i.e. temporary installation vessel activity, installation of limited additional infrastructure (cable, cable protection and up to two BLPs) and infrequent short-term vessel activity associated with O&M
- The highly localised area within which activity will occur
- That the activity will occur within an area of existing infrastructure (established oil and gas assets)
- Frequent vessel activity associated with Asset O&M (independent of the Brownfield Scope)

it is concluded that no source-pathway-receptor route exists by which activity associated with the Brownfield Scope could appreciably impact on ornithological receptors. It is therefore proposed that ornithological receptors can be scoped out of further assessment associated with the Brownfield Scope.

Embedded mitigation relevant to ornithology (Section 10.6) will be applied to the activities associated with the Brownfield Scope.

10.11.1 Brownfield Scoping Questions

The Applicant would request responses to the Brownfield scoping questions of relevance to Section 10. Ornithology. Please respond to Question 5 in Table 1-3.

10.12 References

Department for Business, Energy and Industrial Strategy (BEIS) (2022). UK Offshore Energy Strategic Environmental Assessment 4 (OESEA4). Available online at: https://www.gov.uk/government/consultations/uk-offshore-energy-strategic-environmental-assessment-4-oesea4 [Accessed on 22/02/2023].

Chartered Institute for Ecology and Environmental Management (CIEEM) (2018). Guidelines for Ecological Impact Assessment in Britain and Ireland – Terrestrial, Freshwater, Coastal and Marine. Available online at: https://cieem.net/wp-content/uploads/2018/08/ECIA-Guidelines-2018-Terrestrial-Freshwater-Coastal-and-Marine-V1.2-April-22-Compressed.pdf [Accessed on 22/02/2023].

Cook, A.S.C.P. (2021). Additional analysis to inform SNCB recommendations regarding collision risk modelling. BTO Research Report 739. Report to Natural England. Available online at: https://www.bto.org/sites/default/files/publications/bto_rr_739_cook_collision_risk_models_final_web.pdf [Accessed 02/03/2023].

Department for Environment, Food and Rural Affairs (DEFRA) (2011). UK Marine Policy Statement. Available online at: https://www.gov.uk/government/publications/uk-marine-policy-statement [Accessed 21/02/2023].

Frost, T.M., Austin, G.E., Calbrade, N.A., Mellan, H.J., Hearn, R.D., Stroud, D.A., Wotton, S.R. and Balmer, D.E. (2018). Waterbirds in the UK 2016/17: The Wetland Bird Survey. British Trust for Ornithology.

Joint Nature Conservation Committee (JNCC) & Department for Environment, Food and Rural Affairs (DEFRA) (2012). UK Post-2010 Biodiversity Framework: Published by JNCC and DEFRA on behalf of the Four Countries' Biodiversity Group. Available online at: https://data.jncc.gov.uk/data/587024ff-864f-4d1d-a669-f38cb448abdc/UK-Post2010-Biodiversity-Framework-2012.pdf [Accessed 21/02/2023].

JNCC. 2021. Seabird Population Trends and Causes of Change: 1986–2019 Report (https://jncc.gov.uk/our-work/smp-report-1986-2019). Joint Nature Conservation Committee, Peterborough. Updated 20 May 2021.

Joint SNCB (2014). Joint Response from the Statutory Nature Conservation Bodies to the Marine Scotland Science Avoidance Rate Review. Available online at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010053/EN010053-001013-Natural%20England%20(2).pdf#:~:text=This%20joint%20SNCB%20position%20represents%20a%20considerable%20shift,available%2C%20e.g.%20ORJIP%20study%20%28refer%20to%20section%206%29 [Accessed 02/03/2023].

Joint SNCB (2022). Joint SNCB Interim Displacement Advice Note. Available online at: https://hub.jncc.gov.uk/assets/9aecb87c-80c5-4cfb-9102-39f0228dcc9a [Accessed 02/03/2023].

King, S., Maclean, I., Norman, T., and Prior, A. (2009). Developing guidance for cumulative impact assessment for offshore wind farm developers. COWRIE. Available online at: https://tethys.pnnl.gov/publications/developing-guidance-ornithological-cumulative-impact-assessment-offshore-wind-farm [Accessed 02/03/2023].

NatureScot (2020). Seasonal Periods for Birds in the Scottish Marine Environment. Short Guidance Note. Version 2. October 2020. Available online at: https://www.nature.scot/sites/default/files/2020-10/Guidance%20note%20-%20Seasonal%20definitions%20for%20birds%20in%20the%20Scottish%20Marine%20Environment.pdf#:~:text=Suggested%20seasonal%20definitions%20for%20birds%20in%20the%20Scottish,%28birds%20in%20marine%20environment%20only%20on%20active%20passage%29 [Accessed 02/03/2023].

NatureScot (2023). Advice on Marine Renewables Development: Birds guidance. Guidance Notes 1 through 11. Available online at: https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/renewable-energy/marine-renewables/advice-marine-renewables-development [Accessed 02/03/2023].

Scottish Government (2014). Scottish Planning Policy. Available online at: https://www.gov.scot/publications/scottish-planning-policy/ [Accessed 21/02/2023].

Scottish Government (2015). Scotland's National Marine Plan. Available online at: https://www.gov.scot/publications/scotlands-national-marine-plan/ [Accessed 21/02/2023].

Scottish Natural Heritage (NatureScot) (2014). Recommendations for the Presentation and Content of Interim Marine Bird, Mammal, and Basking Shark Survey Reports for Marine Renewable Energy Development. Available online at: https://tethys.pnnl.gov/sites/default/files/publications/Guidance-Recommendations-for-presentation-and-content-of-interim-reports.pdf [Accessed 02/03/2023].

Scottish Natural Heritage (NatureScot) (2018). A handbook on environmental impact assessment Guidance for Competent Authorities, Consultees and others involved in the Environmental Impact Assessment Process in Scotland. Version 5. April 2018. Available online at: https://digital.nls.uk/pubs/e-monographs/2020/216527997.23.pdf [Accessed 21/02/2023].

Woodward *et al.* (2019). Desk-based revision of seabird foraging ranges used for HRA screening. Report of work carried out by the British Trust for Ornithology on behalf of NIRAS and The Crown Estate (BTO Research Report No.724).

11 MARINE MAMMALS

11.1 Introduction

This section of the Scoping Report identifies the marine mammal receptors of relevance to the Marine Scheme and considers the potential impacts of the Marine Scheme on marine mammals during the installation, operation and maintenance, and decommissioning phases.

The marine mammal receptors considered within this section include large, highly mobile and potentially migratory species which have been identified in the offshore waters around the Marine Scheme. These species include cetaceans and pinnipeds, as well as consideration of other megafauna including basking sharks and sea turtles.

This section of the Scoping Report should be read in conjunction with the following sections:

- Section 6 Physical Environment;
- Section 7 Benthic Ecology;
- Section 9 Fish and Shellfish Ecology; and
- Section 12 Commercial Fisheries.

11.2 Legislation, Policy and Guidance

In addition to the relevant policy and legislation described in Section 2, the following section outlines the legislation, policy and guidance that will be taken into consideration in relation to the marine mammals EIA

11.2.1 International Legislation and Policy

- The Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas 1992 (ASCOBANS) (as amended) (United Nations Environment Programme (UNEP), 1992); and
- Convention for the Protection of the Marine Environment of the North-East Atlantic (the 'OSPAR Convention') adopted in 1998 and amended in 2007.

11.2.2 National Legislation

UK

- The Wildlife and Countryside Act 1981.

Scotland

- The Nature Conservation (Scotland) Act 2004.
- The Protection of Seals (Designation of Haul-Out Sites) (Scotland) Amendment Order 2014 (as amended); and
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended).

11.2.3 National Policy

UK

- UK Post 2010 Biodiversity Framework (JNCC & DEFRA, 2012).

Scotland

- Scotland's Biodiversity: a route map to 2020 (Scottish Government, 2015).

11.2.4 Guidance

- Chartered Institute for Ecology and Environmental Management (CIEEM) (2018): Guidelines for Ecological Impact Assessment in Britain and Ireland – Terrestrial, Freshwater, Coastal and Marine;
- Marine Management Organisation (MMO) (2021): Guidance seals;
- Marine Scotland (2014): Guidance: harassment at seal haul-out sites;
- Marine Scotland (2020): The protection of Marine European Protected Species from injury and disturbance – Guidance for Scottish Inshore Waters (July 2020 Version);
- NatureScot (2017a): The Scottish Marine Wildlife Watching Code;
- NatureScot (2017b): A Guide to Best Practice for Watching Marine Wildlife;
- JNCC (2010): Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise;
- JNCC (2017): Guidelines for minimising the risk of injury to marine mammals from geophysical surveys (seismic survey guidelines);
- JNCC (2021): Guidelines for minimising the risk of disturbance and injury to marine mammals whilst using explosives;
- Scottish Natural Heritage (NatureScot) (2018): A handbook on environmental impact assessment Guidance for Competent Authorities, Consultees and others involved in the Environmental Impact Assessment Process in Scotland (Version 5; April 2018);
- Shark Trust (n.d.): The Basking Shark Code of Conduct: Guidelines to help water-users reduce the risk of injuring or harassing Basking Sharks; and
- Southall *et al.*, (2019): Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects.

11.3 Study Area

Marine mammals are highly mobile, and some species are migratory. For these reasons the marine mammals Study Area encompasses a wide geographic range to include all potential species which might occur within the Marine Scheme. The marine mammals Study Area identifies the Inter-Agency Marine Mammal Working Group (IAMMWG) Management Units (MU), and Special Committee on Seals (SCOS) Seal Management Units (SMU) overlapping with the Marine Scheme. According to IAMMWG (2022), the MUs for the Marine Scheme include the North Sea (NS) MU for harbour porpoise, Coastal East Scotland (CES) and Greater North Sea (GNS) for bottlenose dolphin, and a single MU, the Celtic and Greater North Seas (CGNS) MU, has been defined for other species including common dolphin, white-beaked dolphin, Atlantic white-sided dolphin, Risso's dolphin, and minke whale (Figure 11-1).

The assessment will utilise available data from Block R and T of the Small Cetaceans in the European Atlantic and North Sea (SCANS)-III survey data to characterise density and abundance of cetaceans in the UK and Northern European waters (Hammond *et al.*, 2021). For pinnipeds, the marine mammals Study Area incorporates the East Scotland SMU. The Moray Firth SMU is also considered due to its proximity and the mobile nature of both grey and harbour seals.

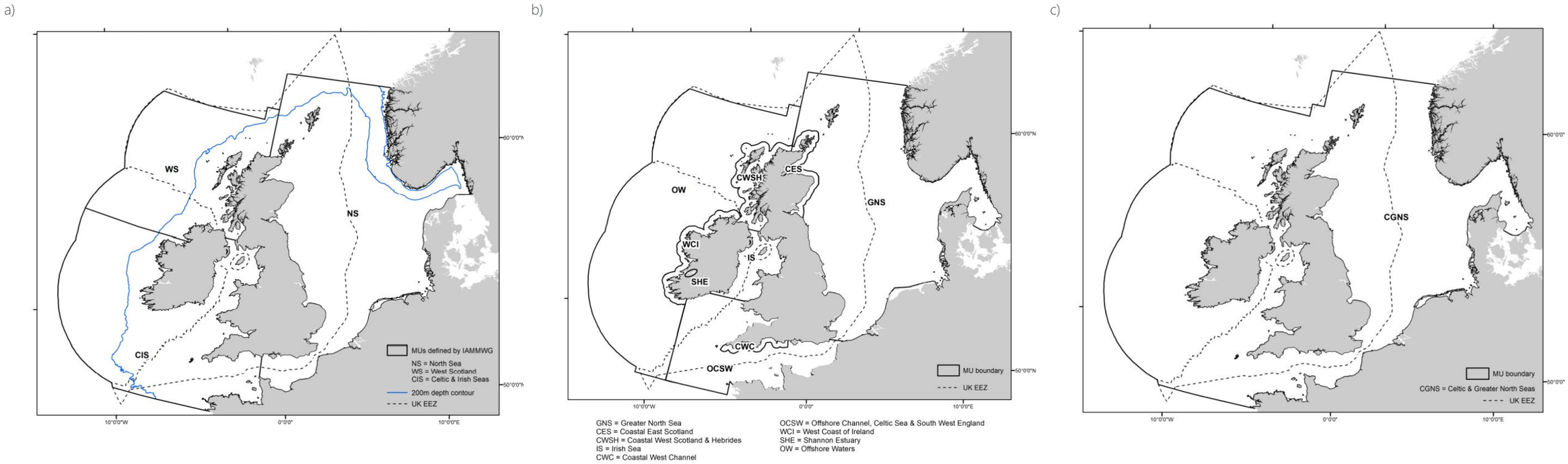

Figure 11-1 Marine Mammal Management Units for cetacean species: a) harbour porpoise, b) bottlenose dolphin, and c) the Celtic and Greater North Seas Management Unit for common dolphin, white-beaked dolphin, Atlantic white-sided dolphin, Risso's dolphin, and minke whale (IAMMWG, 2022)

11.4 Key Data Sources

The existing data sets and literature with relevant coverage to the Marine Scheme which have been used to inform this Scoping Report and are proposed to inform the baseline characterisation for the EIA are outlined in Table 11-1.

Table 11-1 Data sources for the marine mammals assessment

Title	Source	Author	Year
Atlas of cetacean distribution in north-west European waters	https://data.jncc.gov.uk/data/a5a51895-50a1-4cd8-8f9d-8e2512345adf/atlas-cetacean-distribution-web.pdf	Reid *et al.*,	2003
Basking sharks in the northeast Atlantic: Spatio-temporal trends from sightings in UK waters	http://dx.doi.org/10.3354/meps09737	Witt *et al.*,	2012
Revised Phase III Data Analysis of Joint Cetacean Protocol Data Resources	https://hub.jncc.gov.uk/assets/01adfabd-e75f-48ba-9643-2d594983201e	Paxton *et al.*,	2016
Descriptions of Scottish Priority Marine Features (PMFs). Scottish Natural Heritage Commissioned Report No. 406.	https://www.nature.scot/doc/naturescot-commissioned-report-406-descriptions-scottish-priority-marine-features-pmfs	Tyler-Walters *et al.*,	2016
East Coast Scotland Marine Mammal Acoustic Study (ECOMMAS)	https://data.marine.gov.scot/dataset/east-coast-marine-mammal-acoustic-study	Brookes	2017
A Framework for Studying the Effects of Offshore Wind Development on Marine Mammals and Turtles	https://www.boem.gov/sites/default/files/environmental-stewardship/Environmental-Studies/Renewable-Energy/A-Framework-for-Studying-the-Effects.pdf	Kraus *et al.*,	2019
Designated haul-out sites for seals (Protection of Seals Orders)	https://marine.gov.scot/maps/446	Marine Scotland	2019
Distribution maps of cetacean and seabird populations in the North-East Atlantic	https://doi.org/10.1111/1365-2664.13525	Waggitt *et al.*,	2019
Regional baselines for marine mammal density across the North Sea and Atlantic areas of Scottish waters	https://data.marine.gov.scot/dataset/regional-baselines-marine-mammal-knowledge-across-north-sea-and-atlantic-areas-scottish	Hague *et al.*,	2020
The protection of Marine European Protected Species from injury and	https://www.gov.scot/publications/marine-european-protected-species-	Marine Scotland	2020

Title	Source	Author	Year
disturbance Guidance for Scottish Inshore Waters (July 2020 Version)	protection-from-injury-and-disturbance/		
Improving understanding of bottlenose dolphin movements along the east coast of Scotland (Final Report)	https://risweb.st-andrews.ac.uk/portal/en/researchoutput/improving-understanding-of-bottlenose-dolphin-movements-along-the-east-coast-of-scotland-final-report(f49a6c03-60c2-4e71-9c8f-5a3476ff216f)/export.html	Arso Civil *et al.*,	2021
SCANS-III[19] revised report on estimates of abundance	https://scans3.wp.st-andrews.ac.uk/files/2021/06/SCANS-III_design-based_estimates_final_report_revised_June_2021.pdf	Hammond *et al.*,	2021
Scientific Advice on Matters Related to the Management of Seal Populations	http://www.smru.st-andrews.ac.uk/files/2022/08/SCOS-2021.pdf	SCOS	2021
UK Offshore Energy Strategic Environment Assessment 4 (OESEA4): Appendix 1a.8 Marine mammals	https://www.gov.uk/government/consultations/uk-offshore-energy-strategic-environmental-assessment-4-oesea4	BEIS	2022
Sympatric Seals, Satellite Tracking and Protected Areas: Habitat-Based Distribution Estimates for Conservation and Management	https://doi.org/10.3389/fmars.2022.875869	Carter *et al.*,	2022
Updated abundance estimates for cetacean Management Units in UK waters (Revised March 2022)	https://hub.jncc.gov.uk/assets/3a401204-aa46-43c8-85b8-5ae42cdd7ff3	IAMMWG	2022
SCANS-III density surface modelling report	https://scans3.wp.st-andrews.ac.uk/files/2022/08/SCANS-III_density_surface_modelling_report_final_20220815.pdf	Lacey *et al.*,	2022
Salamander Offshore Wind Farm Scoping Report	https://marine.gov.scot/marine-licence-applications	Ørsted and Simply Blue Group	2023
National Whale and Dolphin Watch Sightings	https://www.seawatchfoundation.org.uk/recentsightings/	Sea Watch Foundation	2023

[19] *The SCANS-IV survey was completed in the Summer of 2022 – the results are yet to be published. For more information see: https://storymaps.arcgis.com/stories/6435641aed5745d1b2471e5e59e6af94*

Given the scale of the Marine Scheme, and the short duration, minor impacts to marine mammals that would be expected, it is not considered proportionate to conduct site-specific surveys for marine mammals. The assessment will use existing data (e.g. data derived from SCANS III surveys) and no site-specific marine mammal surveys will be undertaken for the Marine Scheme.

11.5 Baseline Environment

This section provides information on the key marine mammal receptors across the marine mammals Study Area as described in Section 11.3. The description of the baseline environment for marine mammal receptors has been informed by a desk-based review of the most up to date available data sources and literature (Table 11-1).

11.5.1 Cetaceans

All cetacean species are listed as European Protected Species (EPS) under Annex IV of the EU Habitats Directive. There have been 23 species of whales, dolphins, and porpoises recorded in Scottish inshore waters (Marine Scotland, 2020). The following are the most common cetacean species in Scottish waters (Hague *et al.*, 2020):

- Bottlenose dolphin (*Tursiops truncates);*
- Harbour porpoise (*Phocoena phocoena*);
- Risso's dolphin (*Grampus griseus*);
- White-beaked dolphin (*Lagenorhynchus albirostris*); and
- Minke whale (*Balaenoptera acutorostrata*).

Bottlenose dolphin, harbour porpoise, Risso's dolphin, and white-beaked dolphin are considered to be resident and abundant in Scottish waters. Bottlenose dolphin are common in the coastal waters of northeast Scotland, primarily distributed in the nearshore waters of <20 m depth and within 2 km of the coast (Quick *et al.*, 2014). There is a resident population of ca. 224 individuals present in the Moray Firth (Arso Civil *et al.*, 2021; IAMMWG, 2022). Harbour porpoises are considered to be the most frequently sighted cetacean in Scottish and UK waters. Risso's dolphin are common in offshore, deeper waters along the continental shelf edge, and sightings are most frequent from June to September (Hague *et al.*, 2020; BEIS *et al.*, 2022). According to the SCANS-III survey, the highest densities of Risso's dolphin were recorded in the Outer Hebrides. Risso's dolphin are occasionally observed with other cetaceans such as the white-beaked dolphin and Atlantic white-sided dolphin (*Lagenorhynchus acutus*). The white-beaked dolphin and white-sided dolphin have overlapping ranges in the offshore waters to the north and west of Scotland, with the highest densities of white-sided dolphin along the continental shelf edge from May to November (BEIS, 2022). Due to the overlapping ranges, it can be difficult to distinguish the white-beaked and white-sided dolphin during surveys and therefore they are often recorded as *Lagenorhynchus spp*. (BEIS, 2022). Minke whale are the most common among the baleen whale species in the North Sea (BEIS, 2022) with records of some remaining year-round; however, they are considered a seasonal visitor as they are found primarily in the summer months (May to October) (Anderwald and Evans, 2008; Hague *et al.*, 2020).

The Moray Firth Special Area of Conservation (SAC) is located approximately 93 km west of the Marine Scheme and has been designated for bottlenose dolphin. Individuals associated with this resident population range widely around eastern Scotland and are primarily observed along the inner and southern coast of the Moray Firth, Aberdeenshire

coast and Tay Estuary (Quick *et al.*, 2014). The Southern Trench NCMPA is located approximately <1 km north of the Marine Scheme. The Southern Trench NCMPA is designated for minke whale and is therefore the closest protected site with cetacean qualifying features. Turbot Bank NCMPA, located approximately <1 km SE of the Marine Scheme is designated for sandeel, which are a notable prey species for many cetaceans.

As introduced in Section 11.3, the marine mammals Study Area overlaps with Block R of the SCANS-III aerial survey and the potential for impacts from underwater noise extend into Block T. The estimated density and abundance of cetaceans within Block R and Block T are provided in Table 11-2, along with the estimated abundance for their respective MUs (see Section 11.3).

Table 11-2 Density estimates for key cetacean species within the marine mammals Study Area (IAMMWG, 2022; Hammond et al., 2021)

Species	Estimated density (Animals / km^2) (Hammond *et al.*, 2021)		Estimated abundance in the UK portion of the MU & per block (IAMMWG, 2022)
	Block R	Block T	
Bottlenose dolphin	0.0298	No sightings	CES: 224[20] GNS: 1,884 Block R: 1,924 Block T: No sightings
Harbour porpoise	0.599	0.402	NS: 159, 632 Block R: 38,646 Block T: 26,309
Minke whale	0.0387	0.0316	CGNS: 10,288 Block R: 2,498 Block T: 2,068
White-beaked dolphin	0.243	0.037	CGNS: 34,025 Block R: 15,694 Block T: 2,417

All four cetacean species presented in Table 11-2 are listed as Scottish Priority Marine Features (PMFs) (Tyler-Walters *et al.*, 2016). Additionally, the harbour porpoise and bottlenose dolphin are listed under Annex II of the EU Habitats Directive. Therefore, the following are considered key cetacean species present within the Marine Scheme boundary and have been scoped in for the quantitative impact assessment:

- Bottlenose dolphin;
- Harbour porpoise;
- Minke whale; and
- White-beaked dolphin.

[20] *Arso Civil et al., 2021*

It should be noted that the SCANS-III survey data provided density and abundance estimates for the Atlantic white-sided dolphin in Block R (density: 0.0100 animals / km^2; abundance: 644 animals) and Block T (0.0209 animals / km^2; abundance: 1,366 animals). However, these estimates were associated with high uncertainty and corresponded to a single sighting in each block. Atlantic white-sided dolphins are listed as a Scottish PMF (Tyler-Walters *et al.*, 2016). Therefore, Atlantic white-sided dolphins will be considered within the baseline technical report for the EIA using site-specific survey data, but it is not anticipated that they will be subject to the same quantitative impact assessment as the key cetacean species presented above.

11.5.2 Pinnipeds

Both grey seals (*Halichoerus grypus*) and harbour seals (*Phoca vitulina*) are known to occur and breed in UK waters, including on the North Sea coastline. Both species are protected under Annex II of the EU Habitats Directive and are listed as PMFs. Approximately 36% of the world's grey seals breed in the UK and 80% of these breed at colonies in Scotland, with large and rapidly growing breeding colonies on the east coast of Scotland. In addition, approximately 85% of the UK harbour seal population is located in Scotland (SCOS, 2021). In recent decades there has been a significant decline in the harbour seal populations in Orkney, Shetland, and eastern Scotland (including the Firth of Tay) whereas the population of grey seals is slowly increasing. In February 2023, it was confirmed that the Highly Pathogenic Avian Influenza Virus A (HPAIV) H5N1 strain had been detected in grey and harbour seals in Aberdeenshire, Highlands, Fife and Orkney (UK Government, 2023).

Within the Moray Firth SMU, the Dornoch Firth and Morrich More SAC is designated for harbour seal. This site lies approximately 130 km NW of the Marine Scheme. Within the East Scotland SMU, the Firth of Tay and Eden Estuary SAC is designated for harbour seal approximately 120 km south of the Marine Scheme, and the Isle of May SAC is designated for grey seal approximately 145 km south. Additionally, the Protection of Seals (Designation of Haul-Out Sites) (Scotland) Order 2014 designates and affords protection to seal haul-out sites. The nearest seal haul-out is located 17.2 km south southwest of the Marine Scheme at Ythan River Mouth. The nearest known breeding colony is a grey seal pupping site, at Dunbeath-Wick approximately 125 km northwest of the Marine Scheme.

Carter *et al.*, (2022) modelled the habitat preference of grey and harbour seals and predicted at-sea seal distribution on a 5 km x 5 km grid for both species. These data have been processed according to the method described in SCOS (2021), utilising scalars to generate estimates of number of seals within each grid cell (and 95% confidence limits). This is calculated by scaling the Carter *et al.*, (2022) relative density in a cell to an absolute at-sea seal density (mean numbers of seals per cell) using the most recent independent estimate of the grey or harbour seal population and the proportion of the population at sea at a given time. The estimated densities of grey and harbour seals in the vicinity of the Marine Scheme have been obtained from the modelled habitat preference data from Carter *et al.*, (2022). Based on this data, there is an estimated population density of between 0 - 1 and 25 - 50 grey seals per 25 km^2, with potentially 50 - 75 grey seals per 25 km^2 along the coast, and 0 - 3 harbour seals per 25 km^2 (Figure 11-2).

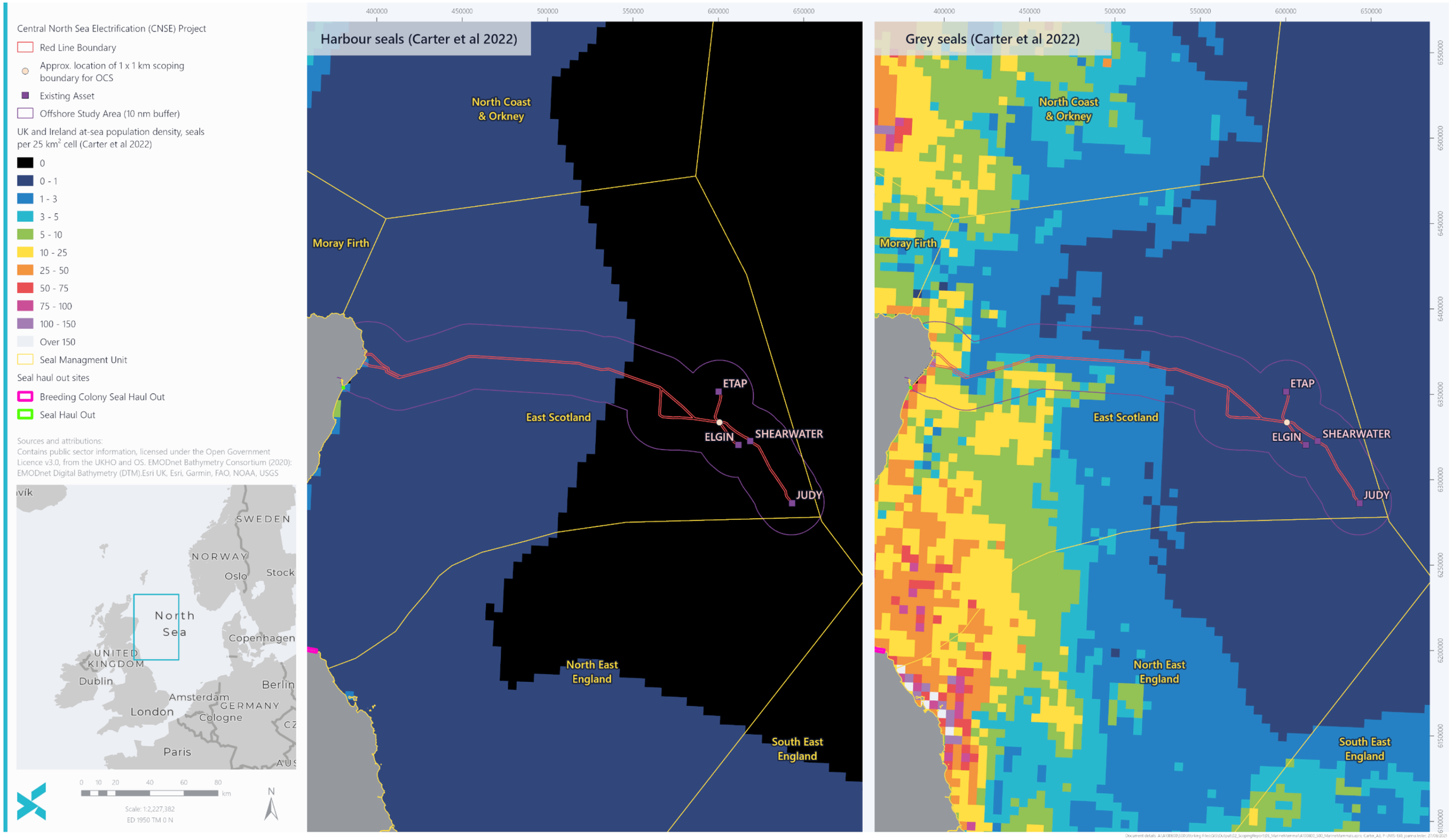

Figure 11-2 Seal distribution (Carter et al., 2022)

11.5.3 Other Megafauna

11.5.3.1 Basking Sharks

The basking shark (*Cetorhinus maximus*) are known to migrate over long distances in both offshore and coastal waters around the UK. Basking sharks are protected under Schedule 5 of the Wildlife and Countryside Act 1981 and the Nature Conservation Act 2004 and are listed on the OSPAR List of Threatened and/or Declining Species (OSPAR, 2008), designated as 'Endangered' on the IUCN Red List of Threatened Species (IUCN, 2018; Rigby *et al.*, 2021), and as a Scottish PMF (Tyler-Walters *et al.*, 2016) following decades of over-exploitation in the Northeast Atlantic (Tyler-Walters *et al.*, 2016; Rigby *et al.*, 2021).

Basking sharks seasonally visit Scottish and English coastlines in the spring and leave in autumn. Sightings are most frequent in the summer which may function as a potential breeding season with aggregations of individuals peaking in July and August. Basking sharks are most heavily concentrated around the Western Isles and Inner Hebrides off west Scotland and southwest England; however, they are also known to occur in the North Sea (Witt *et al.*, 2012). There have been approximately 28 basking shark incidental sightings within 100 km of the Marine Scheme (NatureScot, 2019). Due to the rarity of basking shark presence around the Marine Scheme, this species has been scoped out of further assessment and will not be considered within the EIA for the Marine Scheme.

11.5.3.2 Sea Turtles

The most commonly sighted sea turtles in the UK are leatherback turtles (*Dermochelys coriacea*); however, there are few records and sightings are uncommon (NBN Atlas, 2021). In Scotland, sightings have been recorded most frequently around the southwest coast, as the turtles migrate around the Irish Sea and northeast Atlantic Ocean. There have been unconfirmed sightings along the coast of northeast Scotland at Fraserburgh and Aberdeen. However, due to the remote likelihood of an encounter, this species has been scoped out and will not be considered within the EIA for the Marine Scheme.

11.6 Embedded Mitigation

At this stage topic-specific measures have not been developed; however, certain measures have been proposed as part of the development process in line with industry best-practice to reduce the potential for impacts to marine mammals (Table 11-3). The embedded mitigation specific to marine mammal receptors will be agreed upon by the Applicant and will be detailed within the EIAR. Unless otherwise indicated, the mitigation measures will be secured through the ML consent conditions.

Table 11-3 Proposed embedded mitigation measures

Embedded Mitigation	Type (Primary or Tertiary)
Develop and implement a CEMP, including a Marine Pollution Contingency and Control Plan, and an INNS management plan.	Tertiary
Micro-routeing within the Marine Scheme will be carried out to help avoid or minimise interactions with localised engineering and environmental constraints (including avoidance of any identified seabed heritage assets and other features of archaeological significance). This decision making will be informed by CBRA..	Primary
Compliance with MARPOL regulations and best-practise protocols to prevent and manage incidents of accidental release of marine contaminants.	Tertiary
Marine Mammal Mitigation Protocols (MMMP) for geophysical surveys and UXO clearance (if needed) will be implemented. The MMMP will include development and adherence to a Piling Strategy which delineates the noise mitigation measures will be implemented during piling activities (e.g. soft-start and ramp-up procedures) to reduce potential underwater noise effects during installation. The mitigation measures will be informed by the JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys (JNCC, 2017) and JNCC guidelines for minimising risk of disturbance and injury to marine mammals whilst using explosives (JNCC, 2021).	Tertiary

11.7 Scoping of Impacts

The potential impacts of the Marine Scheme on marine mammal receptors have been identified and considered based on professional experience, the PDE, relevant third-party environmental reports (Section 11.4) and are further described in Table 11-4 below.

Table 11-4 Scoping of potential impacts relating to marine mammal receptors

Potential Impact	Scoping Result	Justification	Information Required to Inform the Assessment	Assessment Method
Installation and Decommissioning				
Noise-related impacts (including physiological impacts, barrier effects and displacement) associated with installation noise: vessels, surveys and cable installation (including seabed preparation activities)	Scoped out	A variety of installation activities may generate noise. These may include but are not limited to the use of: pre-lay grapnel run, mechanical ploughing; mass flow excavation; jet trenching; and/or mechanical trencher. The evidence base suggests that mitigation ensures such impacts are generally limited to short term and temporary displacement or disturbance effects. The sound pressure level (SPL) associated with these installation methods is unlikely to have any significant impacts on acoustically sensitive animals such as marine mammals. The underwater noise generated by these impacts is broadly comparable to general shipping noise (Simard *et al.* 2016; in Jiminez-Arranz *et al.* 2020). There is no risk of auditory injury, and any disturbance is likely to be short term and affecting a small number of individuals. The potential impact has been scoped out		
Noise-related impacts (including physiological impacts, barrier effects and displacement) associated with installation noise: OCS piling	Scoped in	Installation of the OCS may require piled foundations. Impact (or percussive) piling is known to generate sound levels which can cause auditory injury to marine mammals. If impact piling is used, this is likely to comprise the greatest risk of acoustic impacts to marine mammals from the Marine Scheme. Therefore, this impact requires further consideration.	Available desktop information to describe the baseline environment and inform assessment of impact, including density maps of cetaceans and pinnipeds. Predicted underwater noise levels for the installation period. The inclusion of impact piling within the PDE will require underwater sound propagation modelling.	While most sound sources associated with the Marine Scheme would not be likely to have significant impacts on marine mammals, sound associated with geophysical surveys and impact piling (if required) could introduce the risk of injury, and will be quantitatively assessed. This assessment will be based either on underwater sound propagation modelling for relevant activities, or (where possible) on publicly available data from other projects within the marine area, to assess potential sources and anticipated sound levels associated with installation and decommissioning activities of relevance to the Marine Scheme. A MMMP will be implemented in line with the anticipated noise related impacts identified from the review of publicly available data and information sources.
Disturbance to prey species and habitats of prey species through increases in SSC	Scoped in	Increased sedimentation associated with installation and decommissioning works may lead to restricted visibility in foraging prey species and disturbance to the distribution of prey species, through habitat loss and increases to sediment deposition. Localised changes in sediment type which may also potentially impact seabed dependent prey species (e.g. sandeel). Potential impacts associated with increased SSC as a result of installation or decommissioning works are anticipated to be highly localised and temporary. Marine mammals are highly mobile species, so temporary and localised effects have limited potential to impact the species.	The assessment will be informed by the outcomes of the Physical Environment assessment, the Fish and Shellfish Ecology assessment, the assessment of increased SSC and the outputs from the analysis of benthic surveys.	The principal method to be employed will be careful examination of the findings of the project specific geophysical surveys and benthic surveys. This will provide site specific information on seabed sediment characteristics and seabed dependent species. The assessment will be informed by the result of the increased SSC assessment undertaken for the Benthic Ecology assessment to assess how this might affect prey species.
Disturbance due to pre-installation surveys	Scoped in	Pre-installation surveys may include geophysical and/or benthic surveys, geotechnical surveys, target archaeological surveys, and surveys for UXO or pUXO using ROVs. As marine mammals are sensitive to noise related activities, the pre-installation surveys have the potential to result in behavioural disturbances or/and displacement and requires further consideration.	Available desktop information to describe the baseline environment.	The area of impact will be calculated based on the worst-case seabed footprint associated with the PDE. An assessment of potential cumulative and transboundary impacts on marine mammals will be completed as part of the EIA in line with the process outlined in Section 4.

Potential Impact	Scoping Result	Justification	Information Required to Inform the Assessment	Assessment Method
Disturbance due to the physical presence of vessels	Scoped out	The potential for the physical presence of installation or decommissioning vessels to generate a disturbance response in marine mammals is considered negligible given the levels of shipping activity which characterise the existing baseline and the addition of a small number of vessels during the installation and decommissioning phases of the Marine Scheme. The physical presence of vessels in the nearshore environment is also considered unlikely to result in a potential impact to pinnipeds at haul-out, with the nearest haul-out located at the Ythan River Mouth (approximately 17.2 km to the south of the Marine Scheme). The potential impact has been scoped out		
Indirect effects of underwater noise on prey species	Scoped out	Disturbance to prey species caused by underwater noise generated during installation may negatively impact diadromous fish and fish spawning behaviour, particularly for sensitive species such as sandeels within the marine mammals Study Area. The localised and temporary nature of the cable installation activities and increase in vessel traffic associated with installation of the Marine Scheme is not however expected to significantly impact on prey species. The potential impact has been scoped out		
Risk of injury resulting from collisions with installation vessels	Scoped out	Increased localised vessel traffic as a result of installation is not expected to significantly increase collision risk to marine mammals. Vessel activities will fall within standard (e.g. transit) speeds and will follow prescribed routes, thereby reducing the possibility of collision. Additional mitigations will be considered to further reduce any potential collision events, including: maintaining manned bridges, training vessel crew in the Scottish Marine Wildlife Watching Code and following the relevant (*i.e.*, activity-specific) JNCC guidance for minimising the risks of injury to marine mammals and other megafauna during installation, which may include use of a marine mammal observer. Mitigation measures for marine mammal and other megafauna species relevant to the Marine Scheme will be outlined in the supporting MMMP. The potential impact has been scoped out		
Impacts associated with effects on water quality due to disturbed sediment	Scoped out	Installation activities comprise the primary pathway which may influence water quality through disturbed sediments. Changes in turbidity due to installation of the Marine Scheme will be short-lived, with resettlement taking place within hours or days. Marine mammals regularly occupy waters with varying levels of turbidity, including exceptionally murky tidal waters, for extended periods without any important impacts to their biology or behaviour. Marine mammals have adapted to utilise other sense organs as their primary sensory modality in their marine environment, with pinnipeds using tactile information via their vibrissae (whiskers) and cetaceans using sound (including echolocation) to successfully survive in the ocean. For these reasons, highly localised and temporary changes in water quality from sediment disturbance will not generate significant impacts to marine mammals. The potential impact has been scoped out		
Accidental release of pollutants	Scoped out	Accidental releases of pollutants may arise as a result of accidental spills from vessels or other equipment and have detrimental effects on marine mammals; however, the risk and impact of accidental releases of hazardous substances will be reduced through the implementation of the CEMP, including measures for compliance with international requirements of MARPOL, as well as best practice for works in the marine environment (e.g. preparation of SOPEPs). In this manner, accidental release of potential contaminants from installation vessels will be strictly controlled and procedures will be in place to minimise the potential impact of any accidental release if it occurs, and hence the potential impact has been scoped out.		
Operation and Maintenance				
Long-term habitat change, including the potential for change in foraging opportunities	Scoped in	The impacts occurring from long-term habitat changes at the lower trophic levels may result in significant changes in foraging opportunities for marine mammals.	Available desktop information. Habitat maps and results from the benthic habitat surveys will be used to understand the potential suitability of the seabed at the site for cod, whiting, and sandeel spawning.	The area of impact will be calculated based on the worst-case seabed footprint associated with the PDE. An assessment of potential cumulative and transboundary impacts on marine mammals will be completed as part of the EIA (Section 4).
Displacement or barrier effects resulting from the physical presence of devices and infrastructure	Scoped out	The addition of infrastructure in the marine environment can deter individuals from occupying those areas, potentially leading to exclusions from important habitats or barrier effects to movement. Cables associated with the Marine Scheme will be buried where possible, eliminating barrier effects. The single OCS is likely to have a negligible displacement or barrier effect. The potential impact has been scoped out		
Risk associated with EMFs associated with subsea cabling	Scoped out	Subsea cables emit EMFs along their lengths, with HVAC / HVDC cables emitting the greatest EMFs. Research on the potential effects of EMFs on sensitive marine species have focused on behavioural and physiological effects of exposure in field and laboratory settings. However, the mechanism for detection of EMFs remains relatively poorly understood in the majority of species. Czech-Damal *et al.*, (2012) presented evidence of an electroreceptive system in the Guiana dolphin (*Sotalia guianensis*) which were found to be similar in morphology to the electroreceptors in platypuses and echidnas. There is currently no evidence of the ability to detect EMF in other marine mammals. Studies to determine the ability of harbour seals to perceive EMF for orientation and navigation have been unsuccessful (Renouf, 1991; Hanke and Dehnhardt, 2018). A study by Geelhoed *et al.*, (2022) examined whether the EMF emitted from cables would impact harbour acoustic activity but concluded that there was no relationship and no effect. The risk of EMFs associated with the subsea cables is further reduced when considering that marine mammals are highly mobile and some are migratory species, and therefore any potential impact would be temporary and localised. Further justification for scoping this impact out is presented in Section 11.7.1. Thus, based on the information presented above, the potential impact has been scoped out		
Risk of injury resulting from collision with operation and maintenance vessels	Scoped out	Vessel activity during the operations and maintenance phase of the Marine Scheme will be highly limited and associated primarily with inspections and limited survey effort. Increased localised vessel traffic as a result of operations and maintenance is not expected to significantly increase collision risk to marine mammals. Vessel activities will fall within standard (e.g. transit) speeds and will follow prescribed routes, thereby reducing the possibility of collision. The potential impact has been scoped out.		

11.7.1 Scoping Impact Justification

11.7.1.1 Risk associated with EMFs associated with subsea cabling

Very few studies have assessed the impacts of B- (magnetic) and induced electric (iE)-fields from cables on marine mammals. Where evidence does exist, no study has indicated that EMF from cables would be likely to have a signficant impact upon marine mammals.

Several studies examined whether harbour seals could perceive magnetic fields (Renouf 1991, Hanke 2018) with the conclusion that harbour seals are not able to orient or navigate using Earth's magnetic field. Thus, they are unlikely to be directly impacted by EMFs.

Of the few studies that have investigated EMF effects on cetaceans, the majority focus on dolphins. Investigations on the Guiana dolphin *Sotalia guianensis* found that an individual was able to detect electrical stimulation through their vibrissal follicles (Czech-Damal *et al.*, 2012, Mynett, 2022). However, it was suggested that the levels of EMFs produced from subsea cables may not be high enough to trigger the detection in Guiana dolphins, because the Guiana dolphin electro-sensing threshold was higher than the reported values produced from subsea cables (Czech-Damal *et al.* 2012, Öhman *et al.*, 2007; Taormina *et al.*, 2018). Except for the Guiana dolphin, no evidence of electro-sensitivity has been found in other marine mammals (Czech-Damal 2012).

There is evidence of magneto reception in some species of cetaceans (humpback whale, fin whale, bottlenose dolphin, harbour porpoise), which would indicate that while the B-field from EMFs could be more perceptible than E-field (Bauer 1985, Kirschvink *et al* 1986), this perception could only occur at very localised scales due to the rapid decay in strength of B-fields from cables. No relationship between EMFs emitted from an export cable and harbour porpoise acoustic activity (indicative of presence of this species) was found (Geelhoed *et al.* 2022). Because of the difficulty of determining detectability of EMF by cetaceans through field studies, modelling approaches have been used to assess potential impacts of EMF. A modelling study found that bottlenose dolphins could potentially detect the B-field up to 50 m from a subsea the cable, with the potential to alter direction of travel. However, behavioural impacts would only be likely if the individual is directly above the cable. Furthermore, the animal would only need to move a matter of metres away from the cable to be able to correct its orientation. Furthermore, the mobile and migratory nature of cetaceans makes it highly unlikely that they will be impacted by EMFs for a prolonged period, thus any impacts will likely be short-lived and of minor significance (Tricas and Gill, 2011).

Based upon the low likelihood of any ecological effects of EMF on marine mammals, this potential impact has been scoped out of the EIA.

11.8 Potential Cumulative and Transboundary Impacts

Although the predicted impacts of the Marine Scheme are anticipated to be localised, there is the possibility that certain impacts from the Marine Scheme may interact with other projects, plans and activities, which could result in a cumulative effect on marine mammals. There is the potential for cumulative offshore benthic ecology impacts to occur during the installation phase of the Marine Scheme. The projects to be considered as part of the Cumulative Impact Assessment are summarised in Table 4-3. The assessment will be made based on information in the public domain, and in line with the methodology outlined in Section 4.

The migratory nature of some marine mammal species presents the possibility of overlap with national and international boundaries. Existing published information on marine mammal ranges will be used to determine transboundary connectivity. However, as any works associated with the installation, operation and maintenance and decommissioning of the Marine Scheme are anticipated to result in temporary, highly localised potential impacts, the potential for transboundary impacts, are, in turn, anticipated to be temporary and highly localised.

11.9 Proposed EIA Methodology

The EIA methodology for marine mammals' receptors will be in line with the overall EIA methodology described in Section 4 and will be in accordance with the relevant legislation, policy, and standard industry and best-practice guidance.

The baseline for marine mammals will be informed by the available data and literature described in Section 11.5, in particular the outputs from SCANS III surveys (Hammond *et al.*, 2021) and the seal habitat preference maps produced by Carter *et al.* (2022). Identification of potential impacts from the Marine Scheme on marine mammal receptors will be informed by expert judgement and consultation with key stakeholders (including but not limited to MD--LOT, NatureScot, JNCC, and Whale and Dolphin Conservation), and consultation will be ongoing throughout the EIA process. The potential impacts will then be assessed based on marine-mammal specific sensitivity and magnitude criteria on a scale of 'high, medium, low, or negligible.' For marine mammals, the sensitivity of the receptor is likely to be based on the value of the receptor (*e.g.*, consideration of EPS and those afforded international protection through the designation of SACs) and the tolerance of the species to accommodate a particular effect. The magnitude will consider factors such as the duration, scale, frequency, extent, and reversibility of the effect. The exact sensitivity and magnitude criteria will be outlined in the technical report.

The significance of the potential effects will be evaluated using the significance of effects matrix as described in Section 4. The Marine Scheme will include designed in measures as detailed in Section 11.6, and designed in measures will continue to develop alongside the Marine Scheme as required. Where significant effects are identified in the EIA and not mitigated through designed in measures, secondary mitigation and/or monitoring requirements will be established. A cumulative impact assessment will be carried out as detailed in Section 4.2.3 using publicly available data regarding other developments within the vicinity of the Marine Scheme with the potential to amplify the disturbance to marine mammals receptors.

An EPS licence will be sought in advance of any works associated with the Marine Scheme if there is potential for disturbance to occur to marine mammals. An HRA will be carried out alongside the EIA to identify whether there is potential for there to be a LSE on the integrity of the designated sites with marine mammal qualifying features (e.g., SACs) identified in Section 11.5.

11.10 Scoping Questions

The Applicant would request responses to the Greenfield scoping questions of relevance to Section 11. Marine Mammals. Please respond to Questions 7-14 in Table 1-2.

11.11 Marine Mammals: Brownfield

The baseline description for marine mammal receptors (Section 11.5) does not differ between the Brownfield and the Greenfield Scope.

The Brownfield Scope occupies a very small area relative to the total area utilised by marine mammal receptors (approximately 4 x 500 m safety zones or less than 0.2% of the area occupied by the Greenfield Scope).

Given the following:

- The activity associated with the Brownfield Scope, i.e. temporary installation vessel activity, installation of limited additional infrastructure (cable, cable protection and up to two BLPs) and infrequent short-term vessel activity associated with O&M
- The highly localised area within which activity will occur
- That the activity will occur within an area of existing infrastructure (established oil and gas assets)
- Frequent vessel activity associated with Asset O&M (independent of the Brownfield Scope)

it is concluded that (excluding BLP installation) no source-pathway-receptor route exists by which activity associated with the Brownfield Scope could appreciably impact on marine mammal receptors. It is therefore proposed that marine mammal receptors can be scoped out of further assessment associated with the Brownfield Scope. The exception to this conclusion is associated with impact piling which may be used during installation of the two BLPs. This potential impact is considered further in Table 11-5

Embedded mitigation relevant to marine mammals (Section 11.6) will be applied to the activities associated with the Brownfield Scope.

11.11.1 Brownfield Scoping Questions

The Applicant would request responses to the Brownfield scoping questions of relevance to Section 11. Marine Mammals. Please respond to Question 7 in Table 1-3.

Table 11-5 Scoping of potential impacts relating to marine mammal receptors

Potential Impact	Scoping Result	Justification	Information Required to Inform the Assessment	Assessment Method
Installation and Decommissioning				
Noise-related impacts (including physiological impacts, barrier effects and displacement) associated with installation noise: BLP piling	Scoped in	Installation of the BLPs may require piled foundations. Impact (or percussive) piling is known to generate sound levels which can cause auditory injury to marine mammals. If impact piling is used, this is likely to comprise the greatest risk of acoustic impacts to marine mammals from the Marine Scheme. Therefore, this impact requires further consideration.	Available desktop information to describe the baseline environment and inform assessment of impact, including density maps of cetaceans and pinnipeds. Predicted underwater noise levels for the installation period. The inclusion of impact piling within the PDE will require underwater sound propagation modelling.	While most sound sources associated with the Brownfield Scope of the Marine Scheme would not be likely to have significant impacts on marine mammals, sound associated with impact piling (if required) could introduce the risk of injury, and will be quantitatively assessed. This assessment will be based either on underwater sound propagation modelling for relevant activities, or (where possible) on publicly available data from other projects within the marine area, to assess potential sources and anticipated sound levels associated with installation and decommissioning activities of relevance to the Marine Scheme. A MMMP will be implemented in line with the anticipated noise related impacts identified from the review of publicly available data and information sources.

11.12 References

Anderwald, P. and Evans, P.G.H (2008). Minke whale populations in North Atlantic – an Overview with Special Reference to UK waters. From: Robinson, K.P., Stevick, P.T. & MacLeod, C.D. (Eds) An Integrated Approach to Non-lethal Research on Minke Whales in European Waters. European Cetacean Society Spec. Public. Series 47: 8-13. Available online at: https://seawatchfoundation.org.uk/wp-content/uploads/2012/08/1.-minke-whales-in-the-north-atlantic-review-2008.pdf [Accessed 22/02/2023].

Arso Civil, M, Quick, NJ, Mews, S, Hague, E, Cheney, B, Thompson, PM & Hammond, PS 2021, Improving understanding of bottlenose dolphin movements along the east coast of Scotland. Final report. Report number SMRUC-VAT-2020-10 provided to European Offshore Wind Deployment Centre (EOWDC), March 2021 (unpublished). Available online at: https://group.vattenfall.com/uk/contentassets/c65a1355 3f864f599431d69c8c6a57b4/bottlenose-dolphin-monitoring---final-report-2021.pdf [Accessed on 22/02/2023].

Bauer, G.B., Fuller, M., Perry, A., Dunn, J.R. and Zoeger, J. (1985). Magnetoreception and Biomineralization of Magnetite in Cetaceans. Topics in Geobiology, pp.489–507. doi:https://doi.org/10.1007/978-1-4613-0313-8_24.

Carter, M., *et al.*, (2022). Sympatric seals, satellite tracking and protected areas: habitat-based distribution estimates for conservation and management. Available online at: https://risweb.st-andrews.ac.uk/portal/en/researchoutput/sympatric-seals-satellite-tracking-and-protected-areas(d47cf125-05e1-4c86-b074-4b4de52c77c1).html [Accessed on 21/02/2023].

Chartered Institute for Ecology and Environmental Management (CIEEM) (2018). Guidelines for Ecological Impact Assessment in Britain and Ireland – Terrestrial, Freshwater, Coastal and Marine. Available online at: https://cieem.net/wp-content/uploads/2018/08/ECIA-Guidelines-2018-Terrestrial-Freshwater-Coastal-and-Marine-V1.2-April-22-Compressed.pdf [Accessed on 22/02/2023].

Czech-Damal, N.U., Liebschner, A., Miersch, L., Klauer, G., Hanke, F.D., Marshall, C., Dehnhardt, G., and Hanke, W. (2012). Electroreception in the Guiana dolphin (*Sotalia guianensis*). Proc Biol Sci. 2012 Feb 22; 279(1729):663-8. Available online at: https://doi.org/10.1098/rspb.2011.1127 [Accessed on 16/03/2023].
Czech-Damal, N.U., Liebschner, A., Miersch, L., Klauer, G., Hanke, F.D., Marshall, C., Dehnhardt, G. and Hanke, W. (2011). Electroreception in the Guiana dolphin (Sotalia guianensis). Proceedings of the Royal Society B: Biological Sciences, 279(1729), pp.663–668. doi:https://doi.org/10.1098/rspb.2011.1127.

Department for Business, Energy & Industrial Strategy (BEIS) (2022). UK Offshore Energy Strategic Environmental Assessment 4 (OESEA4). Available online at: https://www.gov.uk/government/consultations/uk-offshore-energy-strategic-environmental-assessment-4-oesea4 [Accessed on 22/02/2023].
Department for Environment, Food & Rural Affairs (DEFRA) (2011). UK Marine Policy Statement. Available online at: https://www.gov.uk/government/publications/uk-marine-policy-statement [Accessed 21/02/2023].

Geelhoed, S., Verdaat, H. and Wilkes, T. (n.d.). Effect of electromagnetic fields generated by Borssele export cables on harbour porpoise acoustic activity. [online] Available at: https://edepot.wur.nl/579669 [Accessed 7 Mar. 2023].

Geelhould, S.C.V., Verdaat, H., and Wilkes, T. (2012). Effect of electromagnetic fields generated by Borssele export cables on harbour porpoise acoustic activity. Wageningen Marine Research report; No. C067/22. Wageningen Marine Research. Available online at: https://doi.org/10.18174/579669 [Accessed 16/02/2023].

Hague, E.L, Sinclair, R.R., and Sparling, C.E. (2020). Regional baselines for marine mammal knowledge across the North Sea and Atlantic areas of Scottish waters. Scottish Marine and Freshwater Series Vol 11 No 12. doi: 10.7489/12330-1 [Accessed 16/03/2023].

Hammond, P.S., Lacey, C., Gilles, A., Viquerat, S., Börjesson, P., Herr, H., Macleod, K., Ridoux, V., Santos, M.B., Scheidat, M., Teilmann, J., Vingada, J. & Øien, N. (2021). Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys. SCANS-III Report, 42pp.

Hanke, F.D., and Dehnhardt, G. (2018). On route with harbor seals – how their senses contribute to orientation, navigation and foraging. Neuroforum, vol. 24, no. 4, 2018, pp. A183-A195. Available online at: https://doi.org/10.1515/nf-2018-A0121 [Accessed 16/03/2023].

Hanke, Frederike D. and Dehnhardt, Guido. "On route with harbor seals – how their senses contribute to orientation, navigation and foraging" Neuroforum, vol. 24, no. 4, 2018, pp. A183-A195. https://doi.org/10.1515/nf-2018-A012

Inter Agency Marine Mammal Working Group (IAMMWG) (2022). Updated abundance estimates for cetacean Management Units in UK waters (Revised 2022). JNCC Report No. 680, JNCC Peterborough, ISSN 0963-8091. Available online at: https://data.jncc.gov.uk/data/3a401204-aa46-43c8-85b8-5ae42cdd7ff3/jncc-report-680-revised-202203.pdf [Accessed 20/02/2023].

IUCN (2018). IUCN Red List: Basking Shark, *Cetorhinus maximus*. Available online at: https://www.iucnredlist.org/species/4292/194720078 [Accessed 20/02/2023].

Jiménez-Arranz, G., Banda, N., Cook, S., Wyatt, R. 2020. Review on existing data on underwater sounds produced by the oil and gas industry. A report prepared by Seiche Ltd for the Joint Industry Programme (JIP) on E&P Sound and Marine Life. Available here: https://gisserver.intertek.com/JIP/DMS/ProjectReports/Cat1/JIP-Proj1.4.2_Review_on_Noise_from_Industrial_Sources.pdf

JNCC & Department for Environment, Food and Rural Affairs (DEFRA) (2012). UK Post-2010 Biodiversity Framework: Published by JNCC and DEFRA on behalf of the Four Countries' Biodiversity Group. Available online at: https://data.jncc.gov.uk/data/587024ff-864f-4d1d-a669-f38cb448abdc/UK-Post2010-Biodiversity-Framework-2012.pdf [Accessed 21/02/2023].

JNCC (2010). Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise. Available online at: https://data.jncc.gov.uk/data/31662b6a-19ed-4918-9fab-8fbcff752046/JNCC-CNCB-Piling-protocol-August2010-Web.pdf [Accessed on 22/02/2023].

JNCC (2017). Guidelines for minimising the risk of injury to marine mammals from geophysical surveys (seismic survey guidelines). Available online at: https://data.jncc.gov.uk/data/e2a46de5-43d4-43f0-b296-c62134397ce4/jncc-guidelines-seismicsurvey-aug2017-web.pdf [Accessed 22/02/2023].

JNCC (2021). Guidelines for minimising the risk of disturbance and injury to marine mammals whilst using explosives. Available online at: https://hub.jncc.gov.uk/assets/24cc180d-4030-49dd-8977-a04ebe0d7aca [Accessed 21/02/2023].

KIRSCHVINK, J.L., DIZON, A.E. and WESTPHAL, J.A. (1986). Evidence from Strandings for Geomagnetic Sensitivity in Cetaceans. Journal of Experimental Biology, 120(1), pp.1–24. doi:https://doi.org/10.1242/jeb.120.1.1.

Marcus C. Öhman, Peter Sigray, and Håkan Westerberg "Offshore Windmills and the Effects of Electromagnetic Fields on Fish," AMBIO: A Journal of the Human Environment 36(8), 630-633, (1 December 2007). https://doi.org/10.1579/0044-7447(2007)36[630:OWATEO]2.0.CO;2

Marine Management Organisation (MMO) (2021). Guidance seals. Available online at: https://www.gov.uk/government/publications/protected-marine-species/seals [Accessed on 22/02/2023].

Marine Scotland (2014). Guidance: harassment at seal haul-out sites. Available online at: https://www.gov.scot/publications/guidance-harassment-at-seal-haul-out-sites/ [Accessed on 22/02/2023].

Marine Scotland (2020). The protection of Marine European Protected Species from injury and disturbance – Guidance for Scottish Inshore Waters (July 2020 Version). Available online at: https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2020/07/marine-european-protected-species-protection-from-injury-and-disturbance/documents/marine-european-protected-species-guidance-july-2020/marine-european-protected-species-guidance-july-2020/govscot%3Adocument/EPS%2Bguidance%2BJuly%2B2020.pdf [Accessed on 16/03/2023].

Mynett, N.S. (2022). Electrosensing in cetaceans: anatomy and implications. [online] e-space.mmu.ac.uk. Available at: https://e-space.mmu.ac.uk/630036/

National Biodiversity Network (NBN) Atlas (2021). *Dermochelys coriacea* (Vandelli, 1761) Leathery Turtle. Available online at: https://species.nbnatlas.org/species/NBNSYS0000188646#tab_recordsView [Accessed 20/02/2023].

NatureScot (2017a). The Scottish Marine Wildlife Watching Code. Available online at: https://www.nature.scot/doc/scottish-marine-wildlife-watching-code-smwwc [Accessed on 22/02/2023].

NatureScot (2017b). A Guide to Best Practice for Watching Marine Wildlife. Available online at: https://www.nature.scot/doc/guide-best-practice-watching-marine-wildlife-smwwc [Accessed on 22/02/2023].

NatureScot (2019). Basking shark incidental sightings and distribution in Scotland's seas. Accessed on the Marine Scotland National Marine Plan Interactive (NMPI). Dataset last revised 2021-03-04. Available online at: https://marine.gov.scot/maps/1180 [Accessed 20/02/2023].

OSPAR (2008). List of threatened and/or declining species and habitats: basking shark. Available online at: https://www.ospar.org/work-areas/bdc/species-habitats/list-of-threatened-declining-species-habitats/fish/basking-shark [Accessed 20/02/2023].

Quick N, Arso M, Cheney B, Islas V, Janik V, Thompson PM & Hammond PS (2014). The east coast of Scotland bottlenose dolphin population: improving understanding of ecology outside the Moray Firth SAC. Document produced as part of UK Department of Energy and Climate Change's offshore energy Strategic Environmental Assessment Programme. 7th May 2014. URN 14D/086, 87pp.Rigby,

C.L., Barreto, R., Carlson, J., Fernando, D., Fordham, S., Francis, M.P., Herman, K., Jabado, R.W., Liu, K.M., Marshall, A., Romanov, E. & Kyne, P.M. (2021). *Cetorhinus maximus* (amended version of 2019 assessment). *The IUCN Red List of Threatened Species* 2021: e.T4292A194720078. https://dx.doi.org/10.2305/IUCN.UK.2021-1.RLTS.T4292A194720078.en [Accessed on 20/02/2023].

Renouf D (1991) Sensory reception and processing in Phocidae and Otariidae. In: Renouf D (ed) Behaviour in Pinnipeds. University Press, Cambridge,10.1007/978-94-011-3100-1_7

Renouf, D. (1991). Sensory reception and processing in Phocidae and Otariidae. In: Renouf, D. (eds) The Behaviour of Pinnipeds. Springer, Dordrecht. Available online at: https://doi.org/10.1007/978-94-011-3100-1_7 [Accessed on 16/03/2023].

Scottish Government (2014). Scottish Planning Policy. Available online at: https://www.gov.scot/publications/scottish-planning-policy/ [Accessed 21/02/2023].

Scottish Government (2015). Scotland's National Marine Plan. Available online at: https://www.gov.scot/publications/scotlands-national-marine-plan/ [Accessed 21/02/2023].

Scottish Natural Heritage (NatureScot) (2018). A handbook on environmental impact assessment Guidance for Competent Authorities, Consultees and others involved in the Environmental Impact Assessment Process in Scotland. Version 5. April 2018. Available online at: https://www.nature.scot/sites/default/files/2018-05/Publication%202018%20-%20Environmental%20Impact%20Assessment%20Handbook%20V5.pdf [Accessed 21/02/2023].

Shark Trust (n.d.) The Basking Shark Code of Conduct: Guidelines to help water-users reduce the risk of injuring or harassing Basking Sharks. Available online at: https://www.sharktrust.org/Handlers/Download.ashx?IDMF=6137b1a1-8518-4327-9922-7b280acb8336 [Accessed 22/02/2023].

Statutory Nature Conservation Bodies (2022). Marine environment: unexploded ordnance clearance joint interim position statement. Available online at: https://www.gov.uk/government/publications/marine-environment-unexploded-ordnance-clearance-joint-interim-position-statement/marine-environment-unexploded-ordnance-clearance-joint-interim-position-statement#contents [Accessed 21/02/2023].

Taormina, B., Bald, J., Want, A., Thouzeau, G., Lejart, M., Desroy, N. and Carlier, A. (2018). A review of potential impacts of submarine power cables on the marine environment: Knowledge gaps, recommendations and future

directions. Renewable and Sustainable Energy Reviews, [online] 96, pp.380–391. doi:https://doi.org/10.1016/j.rser.2018.07.026.

Tricas, T. and Gill, A.B. (2011). Effects of EMFs from Undersea Power Cables on Elasmobranchs and Other Marine Species. [online] dspace.lib.cranfield.ac.uk. Available at: https://dspace.lib.cranfield.ac.uk/handle/1826/7785.

Tyler-Walters, H., James, B., Carruthers, M., Wilding, C., Durkin, O., Lacey, C., Philpott, E., Adams, L., Chaniotis, P.D., Wilkes, P.T.V., Seeley, R., Neilly, M., Dargie, J., and Crawford-Avis, O.T. (2016). Descriptions of Scottish Priority Marine Features (PMFs). Scottish Natural Heritage Commissioned Report No. 406. Scottish Natural Heritage (SNH) Edinburgh

UK Government (2023). Confirmed findings of influenza of avian origin in non-avian wildlife. Updated 8 February 2023. Available online at: https://www.gov.uk/government/publications/bird-flu-avian-influenza-findings-in-non-avian-wildlife/confirmed-findings-of-influenza-of-avian-origin-in-non-avian-wildlife [Accessed 20/02/2023].

United Nations Environment Programme (UNEP) (1992). Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas. Available online at: https://leap.unep.org/sites/default/files/treaty/ascobans-en.pdf [Accessed 21/02/2023].

Witt, M.J., Hardy, T., Johnson, L., McClellan, C.M., Pikesley, S.K., Ranger, S., Richardson, P.B., Solandt, J.L., Speedie, C., Williams, R. and Godley, B.J. (2012). Basking sharks in the northeast Atlantic: spatio-temporal trends from sightings in UK waters. Marine Ecology Progress Series, 459: 121-134.

Zapetis, M., & Szesciorka, A. (2022). Cetacean navigation. In Encyclopedia of animal cognition and behavior (pp. 1263-1270). Cham: Springer International Publishing.

12 COMMERCIAL FISHERIES

12.1 Introduction

This section of the Scoping Report identifies the commercial fisheries receptors of relevance to the Marine Scheme and considers the potential impacts from the installation, operation and maintenance, and decommissioning of the Marine Scheme. This section of the Scoping Report should be read in conjunction with the following sections:

- Section 9 Fish and Shellfish Ecology; and
- Section 13 Shipping and Navigation.

Commercial fisheries are defined for the purpose of this report as activity by licensed fishing vessels undertaken for legitimate capture and sale of finfish and shellfish in the marine environment. Aquaculture, recreational fishing and fishing activities in rivers are not considered within this section; other sea users are considered in Section 15.

Automatic Identification System (AIS) is used to track and monitor vessels and their fishing intensity. UK legislation applying to Scottish territorial and inshore waters requires fishing vessels of 15 m and over to be fitted with an AIS system meeting the IMO standard (SOLAS, 2014). The European Union (EU) requires any fishing vessels exceeding 12 m to transmit their position. This data is collected as VMS data and was updated in 2020 (UK Government, 2021). Although there is not a legal requirement for fishing vessels under 15 m to use AIS and fishing vessels under 12 m to use VMS, some of these smaller vessels opt in for the tracking systems. This results in a large data gap for these smaller vessels which may be best addressed through consultation with local fishing industry members and representatives. CNSE have assigned a Fisheries Liaison Officer (FLO) from Brown & May Fisheries Advice Service. The Marine Scheme and its aims have been introduced to local fishers and fleets, with an initial dialogue established on the indicative location of cable corridoes. Further coordination and consultation are planned for later in 2023. Legislation, expected to come into force by the end of 2023, makes it a legal requirement for all vessels registered in England and under 12 m in length to have an inshore vessel monitoring system (I-VMS) installed (UK Government, 2022) and consultation is underway to consider this for Scotland.

12.2 Legislation, Policy and Guidance

In addition to the relevant policy and legislation described in Section 2, the following section outlines the legislation, policy and guidance that will be taken into consideration in relation to the commercial fisheries EIA.

12.2.1 National Legislation

UK

- The Wildlife and Countryside Act 1981; and
- The Fisheries Act.

Scotland

- The Nature Conservation (Scotland) Act 2004; and

- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended).

12.2.2 Guidance

- Best Practice Guidance for Fishing Industry Financial and Economic Impact Assessments (Seafish, 2012);
- Options and Opportunities for Marine Fisheries Mitigation associated with windfarms (Blythe-Skyrme, 2010);
- Fishing Liaison with Offshore Wind and Wet Renewables Group (FLOWW) Best Practice Guidance for Offshore Renewable Developments: Recommendations for Fisheries Liaison (FLOWW, 2014);
- FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Disruption Settlements and Community Funds (FLOWW, 2015);
- MGN 661 (M+F) Navigation – safe and responsible anchoring and fishing practices (Maritime & Coastguard Agency, 2021);
- Sea Fish Industry Authority and UK Fisheries Economic Network (UKFEN) (2012) Best practice guidance for fishing industry financial and economic impact assessments
- Guidance on commercial fisheries mitigation and opportunities from offshore wind commissioned by Collaborative Offshore Wind Research into the Environment (COWRIE);
- International Cable Protection Committee (2009) Fishing and Submarine Cables – Working Together
- Cefas (2012) Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects. Contract report: ME5403, May 2012; and
- The Mariner's Handbook (NP100) (UKHO, 2020) – Section 9.45 Submarine Cables.

12.3 Study Area

The commercial fisheries Study Area is defined by the ICES Rectangles within which the Marine Scheme is located. These include ICES rectangles 43E8 (landfall), 43E9, 43F0, 43F1 (OCS), 42F1, and 42F2. ICES rectangles 44E8, 44E9, 44F0, 44F1, 43F2 have also been considered as part of the commercial fisheries Study Area given their close proximity to the Marine Scheme and the heightened fishing presence expected nearshore (Figure 12-1).

Reference may also be made to waters outside of these four ICES rectangles to provide contextual information and relevance for fishing activity on a regional basis.

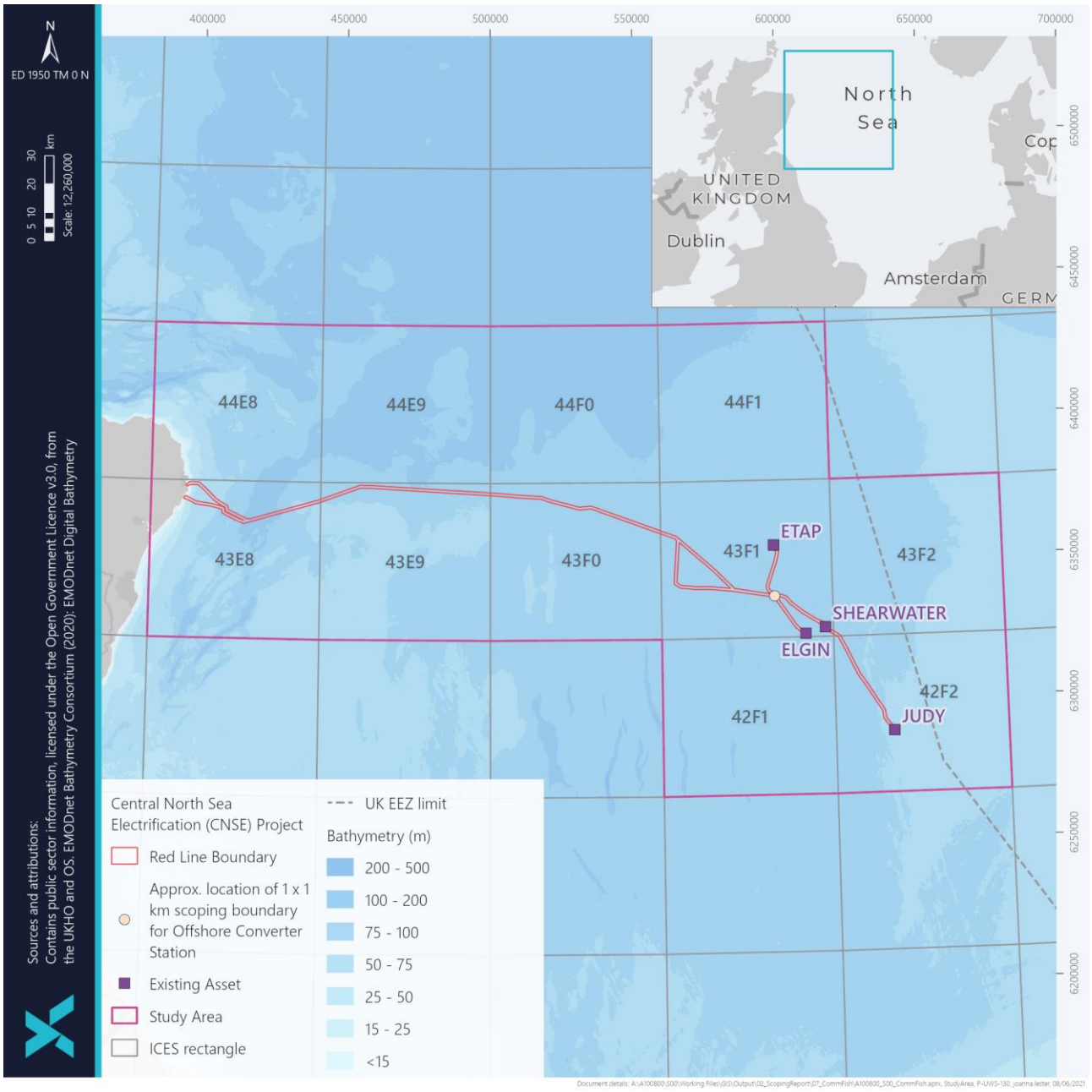

Figure 12-1 Commercial fisheries Study Area

12.4 Key Data Sources

The existing data sets and literature with relevant coverage to the Marine Scheme which have been used to inform this Scoping Report and are proposed to inform the baseline characterisation for the EIA are outlined in Table 12-1

Table 12-1 Data sources for the commercial fisheries assessment

Name of Source	Description / Link	Author	Date
Project specific survey data, including benthic, geophysical and geotechnical survey reports as available	Various	Various	2022-2023
Vessel Monitoring System (VMS) values by fishing method (average)	https://marine.gov.scot/information/average-intensity-hours-fishing-using-ices-vms-data-sets?order=field_map_type&sort=desc&qt-menu_selection=1	MMO	2016-2020
Fisheries statistics per ICES rectangle (2016-2020)[21]	https://www.gov.uk/government/statistics/uk-sea-fisheries-annual-statistics-report-2021	MMO	2016-2020
Average intensity (hours) of fishing with bottom trawls, dredges, and for *Nephrops* and crustaceans	https://marine.gov.scot/information/average-intensity-hours-fishing-using-ices-vms-data-sets	ICES	2009-2016
NBN Atlas	https://nbnatlas.org/		2015
AIS data of fishing vessel tracks	Various	N/A	TBD
ScotMap – Inshore Fisheries Mapping Project in Scotland	https://data.marine.gov.scot/dataset/scotmap-inshore-fisheries-mapping-scotland-recording-fishermen%E2%80%99s-use-sea	Kafas *et al.*	2014
Marine Scotland Salmon and Sea Trout Fishery Statistics and other associated reports	https://www.gov.scot/publications/salmon-fishery-statistics-2020/	Marine Scotland	Various
Creel Fishing Study	https://www.gov.scot/publications/creel-fishing-effort-study/pages/1/	Marine Scotland	2017
Vessel monitoring system devices	https://www.gov.uk/government/publications/vessel-monitoring-system-devices	UK Government	2021
Information gained through consultation	To be reported within EIA	N/A	Various

In addition to the above, third-party impact assessments of surrounding developments will also be utilised to help inform the baseline understanding of the commercial fisheries Study Area including, but not limited to, the environmental appraisals for the Neart Na Gaoithe, Inch Cape, Seagreen Alpha and Bravo, Eastern Link (SEGL1), Eastern Green Link 2, and Berwick Bank Wind Farm (BBWF).

[21] *Please note, the 2021 data has not been considered in Section 12.5.1 due to differences in data formatting. The most recent data will be considered in the EIA. It is not expected that this year of data differs from the general annual trends.*

The above information will contribute to the baseline understanding of commercial fisheries as appropriate. It is anticipated that wider baseline information which is available outside of the commercial fisheries Study Area will be used to help inform the EIA (best-practice and professional judgment will be used to inform the relevance of such data).

12.5 Baseline Environment

An initial desk-based review of literature and available data sources has been undertaken to describe commercial fisheries in the offshore Marine Scheme environment and to inform the Scoping process.

The following sections provide information on the key spatial differences across the commercial fisheries Study Area and Marine Scheme for commercial fishing activity.

12.5.1 Fisheries Statistics

There are some commercial fisheries restriction areas in the project vicinity, primarily applicable to mobile gear types. Within the commercial fisheries Study Area, there is a restriction for sandeel fishing through the entirety of ICES rectangles 44E8 and 43E8 along the shore approach, with the restrictions then allowing a smaller mesh size to be used in sandeel fishing further offshore (Figure 12-2).

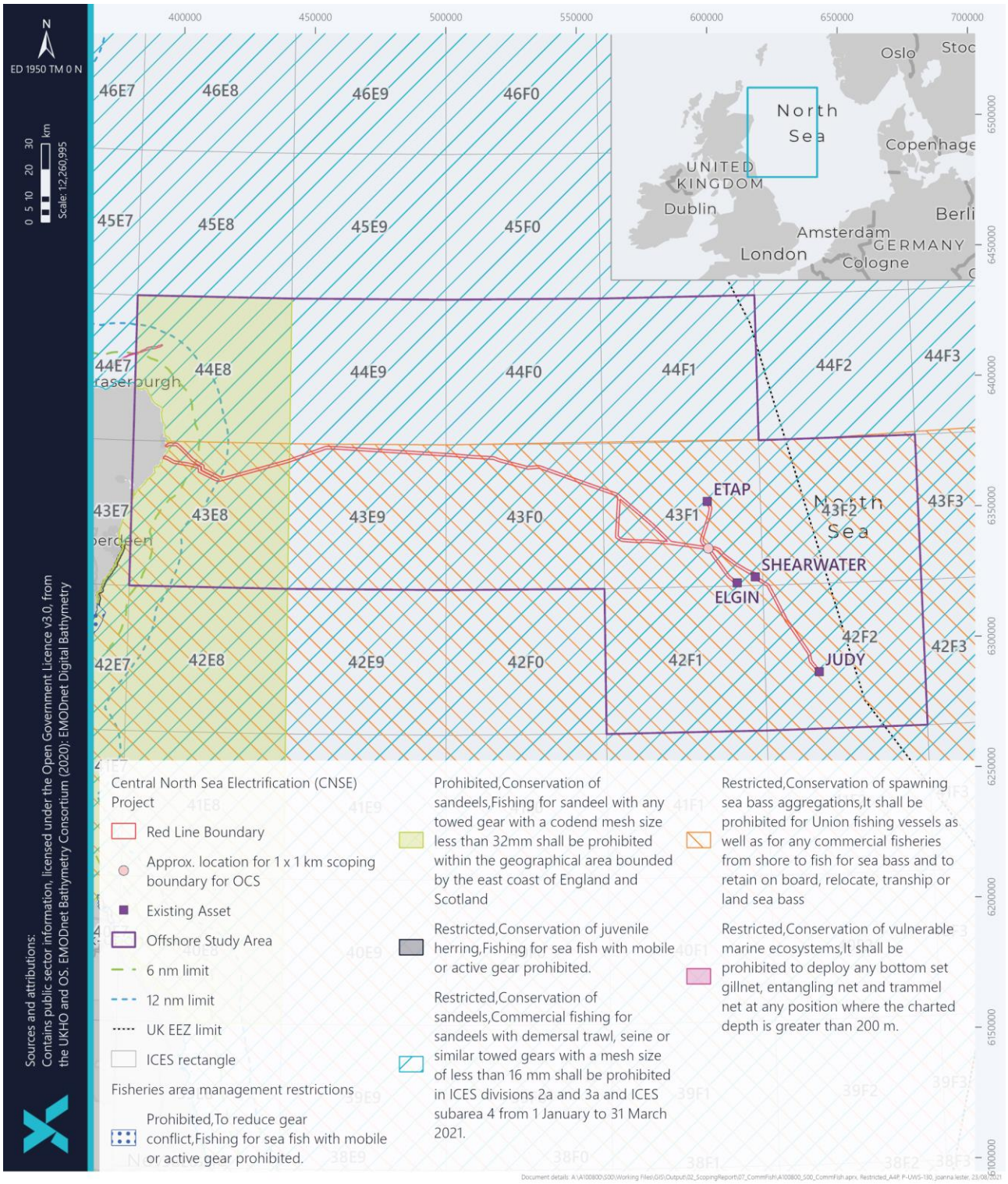

Figure 12-2 Commercial fishing restrictions within the commercial fisheries Study Area

Landings values from 2016 to 2020 per ICES rectangle (MMO, 2023) have been used to calculate the annual average catch by species, vessel length, and fishing method (Figure 12-3).

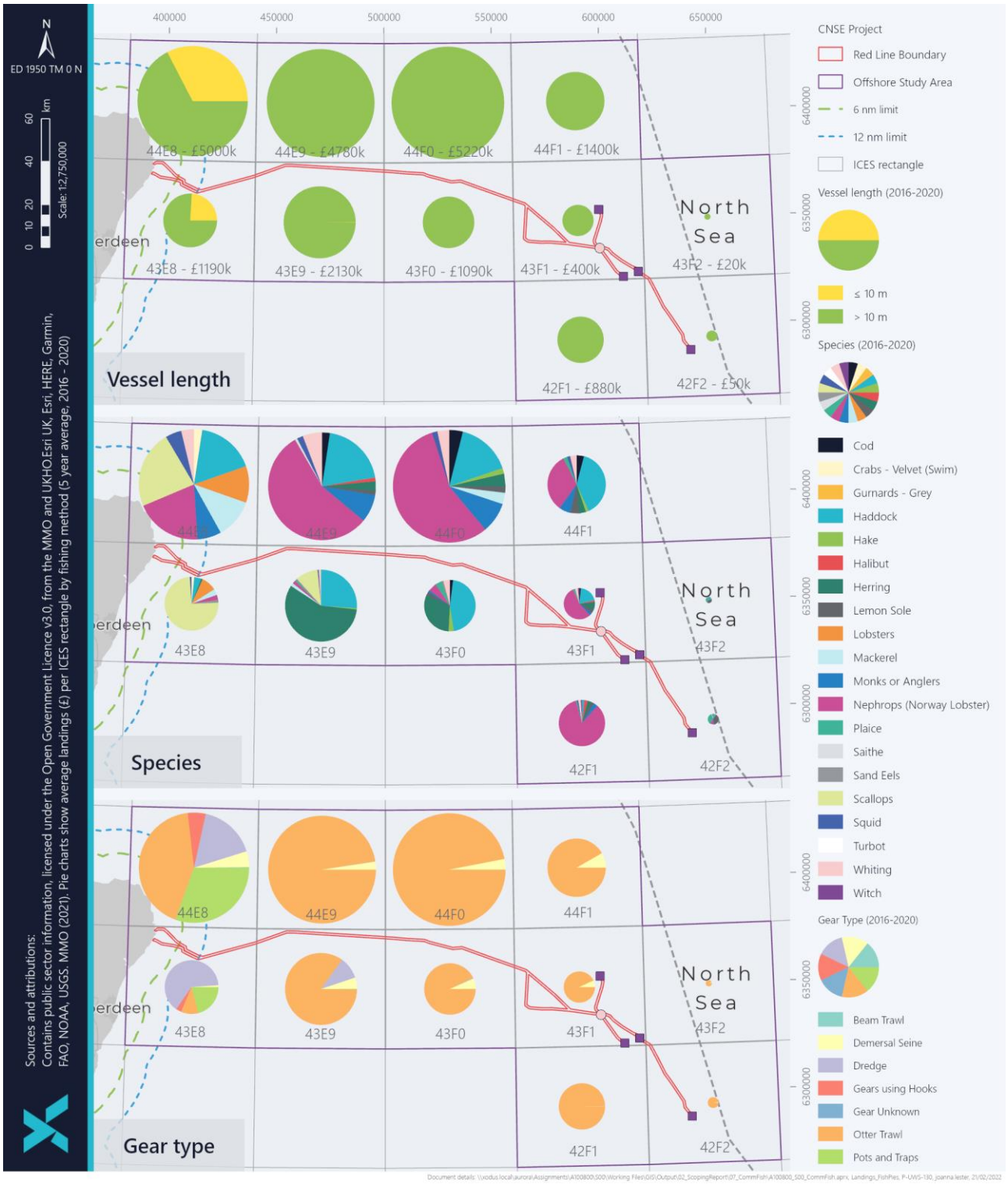

Figure 12-3 Average landings values per ICES rectangle by vessel length, fishing method, and species

In the commercial fisheries Study Area, landings among the top 10 target species (by landed weight) are highest in ICES rectangle 43E9 (largely attributed to herring which make up a large proportion of the catch), which the Marine

Scheme passes through offshore. In general, the highest catch tends to occur in those ICES rectangles closer to the coast (44E8, 44E9, 44F0, and 43E9; Figure 12-1). The proportion of shellfish (namely scallops and Norway lobster) in these ICES rectangles is higher than further offshore. This coincides with the prevalence of shellfish fisheries close to Peterhead (in ICES rectangle 44E8), in particular productive scallop grounds which are located close to the coast. The lowest landings (by weight) recorded in the commercial fisheries Study Area are in ICES rectangles 42F1, 42F2, 43F1 and 43F2 which represent the offshore area of the Marine Scheme (including the OCS and Assets).

When analysing the top ten fisheries targets by landed value, there are some similar and different trends to those observed when analysing by land weight. Cod, haddock, herring, mackerel, monkfish and anglerfish, Norway lobster, scallops, and whiting are still within the top ten targets, with lobster and plaice now making the cut as well. Relative to weight, these are high value catch species. The overall value of landings for these species is highest across 44E8, 44E9, and 44F0, with Norway lobster, scallops, and haddock driving this trend (Figure 12-4).

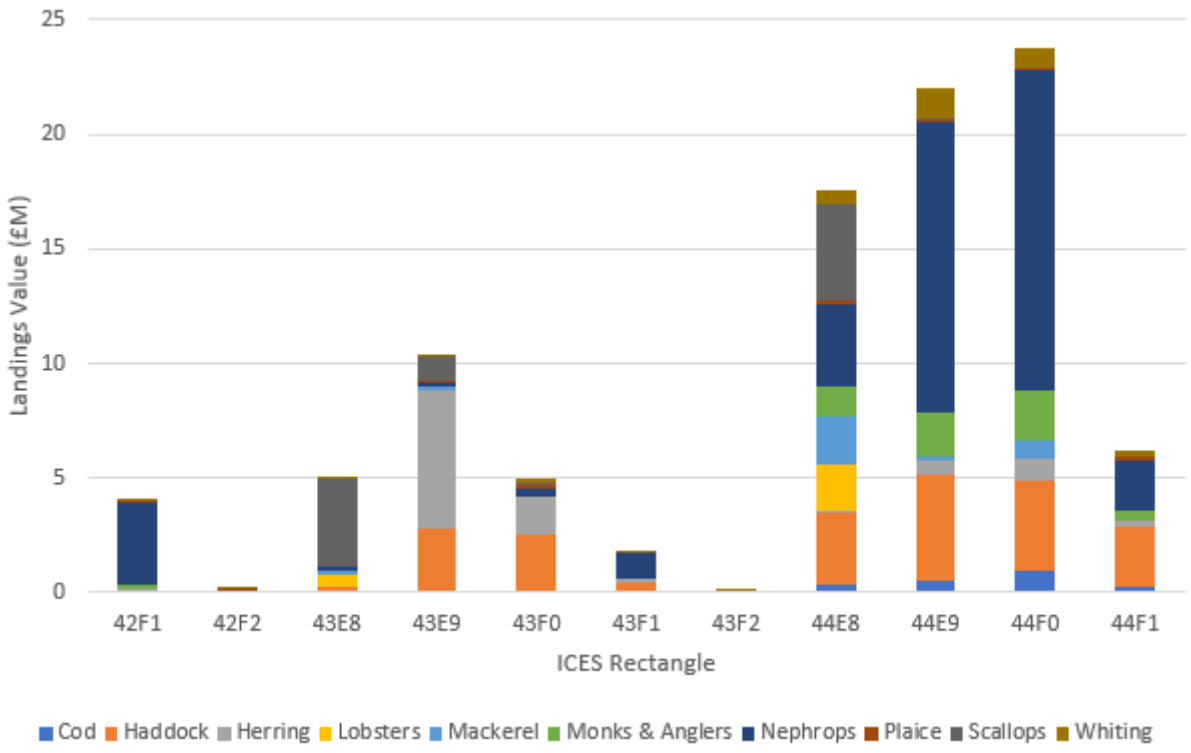

Figure 12-4 Top 10 fisheries targets (by value) from 2016-2020 across the commercial fisheries Study Area

Please note that various factors can influence fishing practices and activities, such as COVID-19 and Brexit for example. The commercial fisheries impact assessment will analyse five years of data (seven years of data will be requested for scallops) in order to ensure that the understanding of fishing activity in the commercial fisheries Study Area is as accurate as possible, it should be noted that the 2020 and 2021 data was impacted by COVID-19. Seasonal and inter-annual variation will also be analysed.

Average landings values by vessel length (under and over 10 m in length) show that vessels over 10 m contribute to the majority of landings in the commercial fisheries Study Area. Relatively higher landings are recorded for vessels 10 m and under in ICES rectangles 43E8 and 44E8, given that these areas are adjacent to shore and host to highly profitable small vessel target species such as lobsters. Otter trawling (demersal seines) largely dominates the fishing activity in the commercial fisheries Study Area. In the nearshore areas (43E8 and 44E8) dredging and pots & traps also contribute a significant proportion of overall landings. Landings by scallop dredges are also recorded in the commercial fisheries Study Area, with the highest values recorded in ICES rectangles 43E8 and 44E8 along the coast. Other fishing methods recorded with comparably lower landings values, include 'other' passive gears, gears using hooks, and beam trawls (Figure 12-3).

Lobster and crabs comprise higher relative landings values in ICES rectangles 43E8 and 44E8, associated with the proportionally higher landings values by pots/traps recorded in these ICES rectangles. Demersal whitefish, mainly whiting haddock, monkfish and anglerfish, and plaice, also contribute to a high proportion of landings values in the commercial fisheries Study Area. Pelagic fish, primarily herring are also recorded with proportionally high landings values in the commercial fisheries Study Area with mackerel being another notable species. Overall, the species which have high values for catch rates reflect the pattern of fishing methods described above.

12.5.2 Vessel Monitoring System (VMS) Data

Average VMS value from 2017 to 2020 for demersal trawling, dredging, static methods (creel gear), and pelagic fishing methods are presented in Figure 12-5 (MMO, 2023). The data generally indicate that fishing activity by over 12 m vessels within the Marine Scheme is low overall, with increasing activity nearer shore. Additionally, the trend indicates that the fishing activity within the commercial fisheries Study Area has hotspots offshore as well, namely ICES rectangle 43E9 across several fishing methods (Figure 12-5). It should be noted that vessels <12 m in length are under represented in VMS data, with activity associated with vessels of this size concentrated to the nearshore environment. Vessels >10 m in length contribute to the majority of landings within the commercial fisheries Study Area (Figure 12-3), and the overall level of commercial fishing activity within the commercial fisheries Study Area is considered to be low when considered on a regional scale.

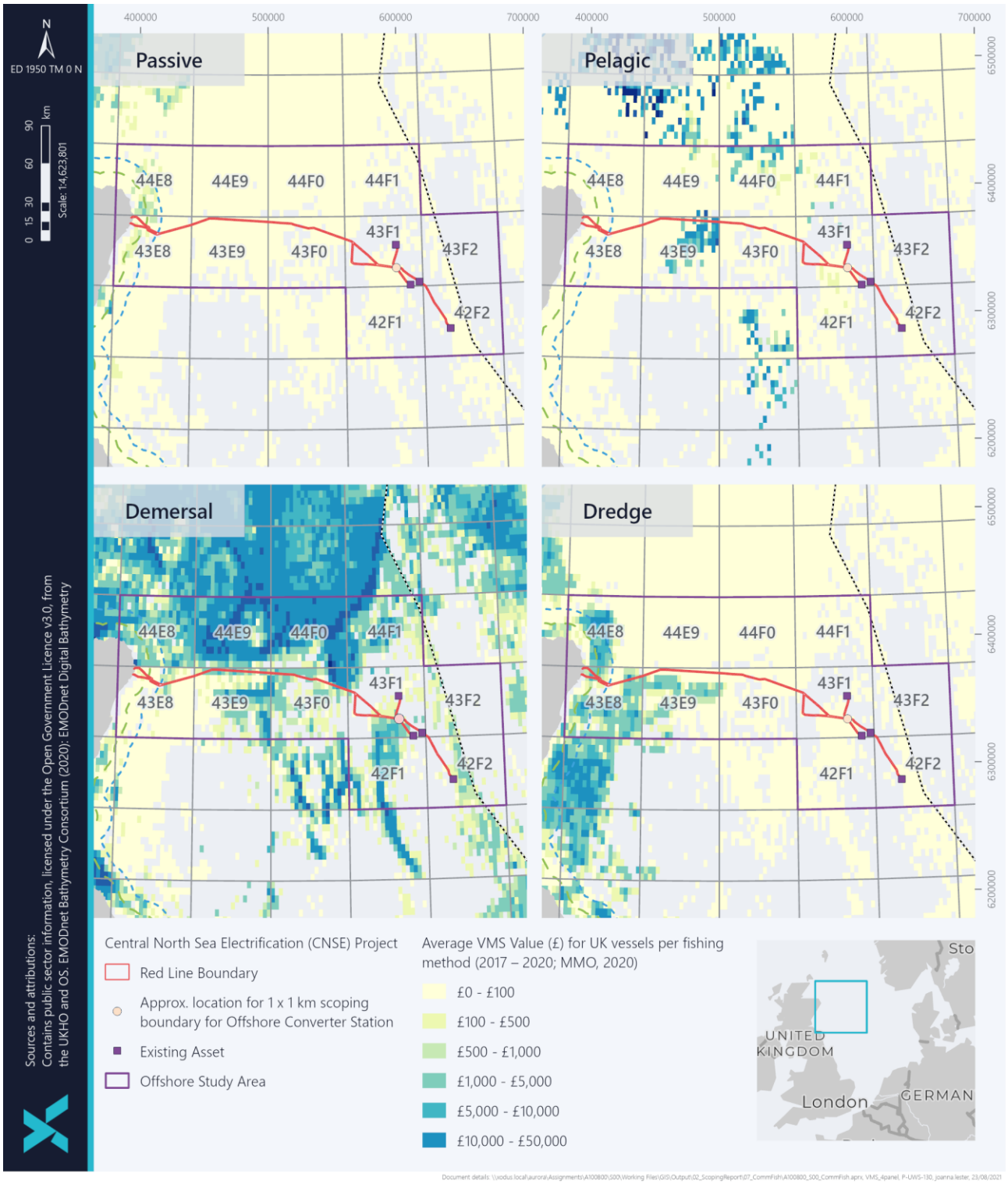

Figure 12-5 Average VMS value for fishing gear types in the commercial fisheries Study Area[22]

[22] *Please note, this VMS data only represents vessels >15 m (despite the requirement for vessels >12 m to have VMS).*

The VMS data indicate that demersal trawling activity, for species such as haddock, monkfish/anglerfish, cod and squid is highest along the northern portion of the commercial fisheries Study Area (ICES Rectangles 44E8, 44E9, 44F0, and 44F1) with relatively even intensity across much of this area (Figure 12-5). However, there are additional demersal fishing value hotspots through 43E9 and south of the proposed OCS location (43F1, 42F1). The north and eastern extents of the existing Assets and OCS see relatively low value for demersal fishing methods.

Scallop dredging does not occur in high values throughout much of the commercial fisheries Study Area. However, there is a notable concentration of dredging along the coast, overlapping with the commercial fisheries Study Area in ICES rectangles 43E8 and 44E8 (Figure 12-5)

Additionally, there is a concentration of fishing value intensity south of the proposed cable in cell 43E9, decreasing as the distance from shore increases.

Fishing activity by static methods, including pots and traps, appears to be relatively low within the commercial fisheries Study Area; however, it is important to note that VMS records likely do not show many of the smaller static gear vessels which fall under 12 m length. There is a small band of low concentration along the coast (44E8 and 43E8) and some general very low concentration coverage throughout the area, but no sites appear to be of particular high value intensity (Figure 12-5). This is consistent with the higher proportional landings values for lobster in 44E8. However, it is anticipated these data reflect a small number of passive fishing vessels over 12 m, and it is likely the intensity of passive fishing nearshore is greater than that reflected in Figure 12-5, which is in agreement with ongoing dialogue and information received to date from local fishers and fleets.

Average VMS values for pelagic fishing methods are relatively low across the commercial fisheries Study Area, with the exception of an area of heightened intensity overlapping with the proposed cable route through 43E9 (Figure 12-5.

The UK Government (2021) VMS data only covers fishing vessels over 12 m in length, but when reviewed in combination with Figure 11.5 (Average Landings Value by Vessel Length), the data indicate that fishing by smaller 12 m and under vessels is likely to be low in the offshore portions of the commercial fisheries Study Area, with activity increasing towards the coastline (43E8 and 44E8), mostly for pots/traps targeting crabs and lobster (Kafas *et al.*, 2014). However, it should be noted that there is often a large data gap when considering vessels under 12 m in length. Due to the paucity of quantitative data on the distribution of fishing effort / value for smaller vessels, it is anticipated that consultation will be a key source to understand the fishing activity in this area. Such consultation will be undertaken with various fishing representatives and local fishers, where necessary, as part of the EIA process, to fill any data gaps and finalise the baseline characterisation. Consultation will be undertaken to understand fishing patterns and practices. This will be in line with relevant guidance (e.g. FLOWW, 2014).

12.5.3 Salmon Fisheries

Scottish and English salmon fisheries include fixed engine, net and coble (i.e. netting) and rod and line fisheries (Marine Scotland, 2023). Across Scotland, the majority of salmon catch is from rod and line (Marine Scotland 2019). However, it is understood that several coastal netting sites are present along the Scottish/English border coastline which have had a status assessment for clean and safe, healthy and biologically diverse assessments. The status assessment noted these areas as having many concerns (Scottish Government, 2021).

Marine Scotland collates salmon catch statistics by district or region on an annual basis. Latest catch statistics for rod and line and net catches within the River Ugie, the most relevant to the commercial fisheries Study Area, were recorded between 2016 and 2020 (Scottish Government, 2021). Records show that salmon catches across Scotland have declined significantly in recent years, and this is expected to partly have resulted from the implementation of the Conservation of Salmon (Scotland) Regulations 2016 (as amended) which has prohibited the retention of salmon caught in coastal waters and in specified inland waters (depending on their conservation status) since 2016. Most rod and line catches are understood to be recreational, so more consideration has been given to fixed engine and net methods.

12.5.4 Nationality of Fishing Activity

It is understood through data from the UK Government that the commercial fisheries Study Area is largely comprised of UK fishing vessels. Scottish vessels are responsible for the majority of fishing activity (by value) in the commercial fisheries Study Area (81.9%) carried out by UK vessels. English and Northern Irish vessels are also noted to be present in abundance of 16.6% and 1.5%, respectively (MMO, 2023), with the vessels of both nationalities primarily using otter trawls to fish for nephrops and various whitefish. Additionally, there are a number of English scallop vessels dredging for scallops in the commercial fisheries Study Area.

Following its departure from the EU, the UK can now regulate the access of non-UK fishing vessels to UK waters. Gradual changes to quota shares and Total Allowable Catches (TACs) will also occur between 2021 and 2026, including a gradual reduction of EU quota shares within UK waters and the transfer of 25% of EU's fishing rights in UK waters to UK fleets (European Council, 2021). Thus, in the wake of the UK's departure from the EU, it is possible that there will be changes to the proportion of international vessels present in the commercial fisheries Study Area.

12.6 Embedded Mitigation

At this stage topic-specific measures have not been developed; however, certain measures have been proposed as part of the development process in line with industry best-practice to reduce the potential for impacts to commercial fisheries (Table 12-2). The embedded mitigation specific to commercial fisheries receptors will be agreed upon by the Applicant and will be detailed within the EIAR. Unless otherwise indicated, the mitigation measures will be secured through the ML consent conditions.

Table 12-2 - Proposed embedded mitigation measures

Embedded Mitigation	Type (Primary or Tertiary)
Develop and implement a CEMP, including a Marine Pollution Contingency and Control Plan, and an INNS management plan..	Tertiary
Cable protection will be designed to be 'fishing-friendly,' and to minimise snagging risk (i.e. graded rock and 1:3 berm profile).	Primary
Placement of scour protection for the OCS will be minimised as far as possible (supported by a scour assessment).	Primary

Embedded Mitigation	Type (Primary or Tertiary)
Appropriate aids to navigation will be implemented on the OCS and safety zones will be in place during installation activities.	Primary
Promulgation of information for vessel routes, timings and locations or activities, safety zones and advisory passing distances as required via Notices to Mariners, Kingfisher Bulletins, radio navigation warnings, Navigational Telex (NAVTEX) and/or broadcast warnings.	Primary
FLO will be appointed and consultation with fisheries working group(s) will be maintained throughout the installation phase to ensure that information relating to the Marine Scheme is disseminated efficiently. Dialogue will be maintained with the commercial fishing industry and access to home ports is maintained during the main fishing season.	Primary
Liaison with Fisheries Industry Representatives (FIRs) as appropriate.	Primary
Compliance with MARPOL, International Regulations for the Prevention of Collision at Sea (COLREGs), and International Regulations for the Safety of Life at Sea (SOLAS) regulations.	Tertiary
Notification to the UK Hydrographic Office of the proposed works to facilitate the promulgation of maritime safety information and updating of nautical charts and publications.	Primary
Presence of guard vessels during construction.	Primary
Post-installation monitoring of cables and associated cable protection (i.e., trenching or external protection where burial is not possible). Where exposed cable sections or other threats to sea users are identified, this will be reported to the MCA, NLB, Kingfisher and UKHO no later than 24 hours after discovery.	Primary

12.7 Scoping of Impacts

The potential impacts of the Marine Scheme on commercial fisheries receptors have been identified and considered based on professional experience, the PDE, relevant third-party environmental reports (Section 11.4) and are further described in Table 11-3 below.

Table 12-3 Scoping of potential impacts relating to commercial fisheries receptors

Potential Impact	Scoping Result	Justification	Information Required to Inform the Assessment	Assessment Method
Installation and Decommissioning				
Temporary loss, displacement or restricted access to fishing grounds due to presence of vessels and safety zones during route preparation and installation activities.	Scoped in	The route preparation will require pre-installation surveys, and also include pre-installation activities to prepare the seabed for laying of the cable and installation of the OCS. The installation activities may include, but are not limited to, route clearance and pre-sweeping. This may result in disruption and disturbance to fisheries, including impacts to static fishing gear operators. The implementation of advisory safe passing distances around the Marine Scheme during cable installation activities, may result in fishing activity being temporarily displaced due to the temporary loss or restricted access to fishing grounds.	Desktop analysis of available public data sources, including those listed within section above and information gained through consultation to characterise the environmental baseline. Review of annual fisheries statistics and other sources to ensure contemporaneous assessment. Consultation to understand potential nature and extent of impact.	The assessment will consider route preparation activities based on the PDE. It is acknowledged that there is potential for a variety of methods to be used. The impact assessment will draw on the latest relevant available literature on this impact. The impact will be qualitatively assessed on a fleet-by-fleet basis, considering available data on fishing activity and potential sensitivity of receptor to this impact.
Interference with fishing activity as a result of increased vessel traffic, including potential increases to steaming times.	Scoped in	Increased vessel traffic associated with installation and decommissioning works may lead to interference with fishing activity. This is due to the increased presence of Marine Scheme installation vessels, potentially restricted access and increased steaming times.	Desktop analysis of available public data sources, including those listed above and information gained through consultation to characterise the baseline. Consultation to understand potential nature and extent of impact.	The maximum number of vessel transits required during installation / decommissioning will represent the PDE for this impact assessment. The impact will be qualitatively assessed on a fleet-by-fleet basis, considering available data on fishing activity and potential sensitivity of receptor to this impact.
Operation and Maintenance				
Potential for fishing gear to become entangled with cable or OCS (i.e. snagging), resulting in damage or loss of fishing gear.	Scoped in	The HVDC and HVAC Cables, and the OCS will be installed as part of the Marine Scheme. All cables will be buried where possible to minimize risk of entanglement or snagging impacts to commercial fisheries. Surface lay protection measures (such as rock or concrete mattresses) will be deployed where burial is not achieved.	Desktop analysis of available data on fishing activity in the area, including those sources listed above and information gained through consultation to characterise the environmental baseline and to understand use of cable route by commercial fisheries. Consultation to understand potential nature and extent of impact.	The worst-case scenario will be based on the OCS footprint and the extent of cable(s) which cannot be buried, based on the Marine Scheme PDE, to understand the area of potential impact.
Long-term habitat loss and disturbance	Scoped in	Long-term habitat loss and disturbance may occur as a result of the presence of installed OCS and cable, rock protection, and clearing of areas to allow for laying of cables. These activities may lead to a change in the seabed type, potentially altering spawning, nursery and feeding habitat. Species that are seabed dependent for some or all of their life cycle (e.g. sandeel, herring, and Norway lobster) are most sensitive to this impact.	Desktop analysis of available public data sources, including those listed above in Section 12.4 and information gained through consultation to characterise the environmental baseline. Consultation to understand potential nature and extent of impact.	The area of impact will be calculated based on the seabed footprint associated with the PDE.
Long-term reduced access to key fishing grounds and resultant displacement	Scoped in	The presence of infrastructure associated with the Marine Scheme may result in a loss or restricted access to fishing grounds. Fishing activity may be displaced into other areas. Any displacement of existing fishing activity may result in increased pressure on other existing grounds; affecting those fishing locally and in other areas. This has the potential to impact existing local fishing management practices and relationships between existing sea users. Overtrawl surveys are not expected to be necessary (per the European Subsea Cables Association position paper (ESCA, 2022)). Any survey requirements will be established during the EIA process in consultation and will be defined post-consent.	Desktop analysis of available data on fishing activity in the area, including those sources listed above and information gained through consultation to characterise the environmental baseline and to understand use of cable route by commercial fisheries. Consultation to understand potential nature and extent of impact.	Section 12.4 outlines the data sources which will provide the baseline, supplemented by data gathered during consultation with stakeholders. As assessment will be undertaken in line with the methodology outlined in Section 12.9 below and informed, as appropriate, by the conclusions of other EIA sections, such as Fish and Shellfish Ecology and Shipping and Navigation.

12.8 Potential Cumulative and Transboundary Impacts

Although the predicted impacts of the Marine Scheme are anticipated to be localised, there is the possibility that certain impacts from the Marine Scheme may interact with other projects, plans and activities, which could result in a cumulative effect on commercial fisheries receptors. There is the potential for cumulative offshore benthic ecology impacts to occur during the installation phase of the Marine Scheme. The projects to be considered as part of the Cumulative Impact Assessment are summarised in Table 4-3. The assessment will be made based on information in the public domain, and in line with the methodology outlined in Section 4.

There is the potential for transboundary impacts upon commercial fisheries receptors due to installation, operation, maintenance and decommissioning of the Marine Scheme, as it lies beyond the 12 NM limit where EU member states have some access to fish. Potential transboundary impacts that will be considered may include all of those relevant to non-UK vessels, including the impacts described in Section 12.7. This will be informed by further desktop analysis of non-UK fishing activity (e.g. through EU Data Collection Framework (DCF) datasets (EU DCF, 2020)) to understand the non-UK fishing activity in the commercial fisheries Study Area.

12.9 Proposed EIA Methodology

The assessment of impacts for commercial fisheries will be conducted in line with the overall EIA methodology described in Section 4 and will be in accordance with the relevant legislation, policy, and standard industry and best-practice guidance.

The Applicant will look to engage with different stakeholders regarding commercial fisheries. To obtain fishing data relevant to the Marine Scheme, the Applicant will engage with key stakeholders, including but not limited to the SFF, Cefas, MMO, MD-LOT, the Regional Inshore Fisheries Groups (RIFGs) as well as liaising with FIRs.

The Applicant will appoint a FLO to work with the commercial fisheries groups such as RIFG to ensure that the Marine Scheme will minimise the potential impacts on any commercial fishing activities in and surrounding the Marine Scheme. The Marine Scheme will adhere to good practice guidance such as that of the Fishing Liaison with Offshore Wind and Wet Renewables Group (FLOWW, 2014; 2015).

12.10 Scoping Questions

The Applicant would request responses to the Greenfield scoping questions of relevance to Section 12. Commercial Fisheries. Please respond to Questions 7-14 in Table 1-2.

12.11 Commercial Fisheries: Brownfield

The Petroleum Act 1987 governs offshore safety zones which are established automatically around all offshore oil and gas installations that project above the sea. Vessels of all nations are required by law to respect safety zones and it is an offence (under section 23 of the Petroleum Act 1987) to enter a safety zone except under special circumstances.

Given that commercial fisheries activity is already excluded from the 500 m safety zone of each Asset, the activity associated with the Brownfield Scope will not have any additional impact on commercial fisheries receptors. It is therefore proposed that commercial fisheries receptors can be scoped out of further assessment associated with the Brownfield Scope.

Embedded mitigation relevant to commercial fisheries (Section 12.6) will be applied to the activities associated with the Brownfield Scope.

12.11.1 Brownfield Scoping Questions

The Applicant would request responses to the Brownfield scoping questions of relevance to Section 12. Commercial Fisheries. Please respond to Question 5 in Table 1-3.

12.12 References

Blyth-Skyrme, R.E. (2010). Options and Opportunities for Marine Fisheries Mitigation Associated with Wind Farms. Final report for Collaborative Offshore Wind Research into the Environment contract FISHMITIG09. COWRIE Ltd, London. Available from: https://tethys.pnnl.gov/sites/default/files/publications/Blyth-Skyrme-2010.pdf [Accessed 29/11/2021].

ESCA (2022). European Subsea Cables Association Position Statement on Post-Installation Fishing Gear Trials. Available online at: https://www.escaeu.org/documents/

European Council. (2021). Fish Stocks Shared Between the EU and the United Kingdom. Available online at: https://www.consilium.europa.eu/en/policies/eu-fish-stocks/eu-uk-fishing-quotas/ .

Kingfisher (2022). UK Fishing Restrictions. Available online at: https://kingfisherrestrictions.org/ [Accessed on: 27 March 2023].

EU DCF. (2020). Fisheries Dependent Information. Available online at: https://stecf.jrc.ec.europa.eu/dd/fdi [Accessed on: 27 March 2023].

FLOWW (2014). Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Liaison. Available at: https://www.thecrownestate.co.uk/en-gb/what-we-do/on-the-seabed/our-partnerships/the-fishing-liaison-with-offshore-wind-and-wet-renewables-group/ [Accessed on: 27 March 2023].

FLOWW (2015). Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Disruption Settlements and Community Funds. Available at: https://www.bing.com/search?q=www.thecrownestate.co.uk%2Fmedia%2F1776%2Ffloww-best-practice-guidance-disruptio%E2%80%A6&form=IPRV10 [Accessed on: 27 March 2023].

International Maritime Organization (2004). Resolution A.1106(29) – Guidelines for the onboard operational use of shipborne automatic identification systems (AIS). Available at: https://www.imo.org/en/OurWork/Safety/Pages/AIS.aspx [Accessed on: 27 March 2023].

Kafas, A., McLay, A., Chimienti, M., Gubbins, M. (2014). ScotMap Inshore Fisheries Mapping in Scotland: Recording Fishermen's use of the Sea. *Scottish Marine and Freshwater Science*, Volume 5 Number 17. Edinburgh: Scottish Government, 32p. DOI: 10.4789/1554-1.

MMO (2023). UK Sea Fisheries Statistics 2021 (updated). Available at: https://www.gov.uk/government/statistics/uk-sea-fisheries-annual-statistics-report-2021 [Accessed on: 27 March 2023].

Marine Scotland (2019). Salmon and Sea Trout Fishery Statistics – 2018 season. Available at: https://scotland.shinyapps.io/sg-salmon-sea-trout-catch/ [Accessed on: 27 March 2023].

Marine Scotland (2023). Salmon and Sea Trout Fishing. Available at: https://marine.gov.scot/sma/assessment/salmon-and-sea-trout-fishing [Accessed on: 27 March 2023].

Scottish Government. (2021). Salmon fishery statistics: 2021. Available online at: https://www.gov.scot/publications/salmon-fishery-statistics-2021/pages/1/ [Accessed on: 27 March 2023].

UK Government. (2021). Vessel monitoring system devices. Available online at: https://www.gov.uk/government/publications/vessel-monitoring-system-devices [Accessed on: 27 March 2023].

UK Government. (2022). Inshore Vessel Monitoring (I-VMS) for under-12m fishing vessels registered in England. Available online at: https://www.gov.uk/guidance/inshore-vessel-monitoring-i-vms-for-under12m-fishing-vessels-registered-in-england [Accessed on: 27 March 2023].

13 SHIPPING AND NAVIGATION

13.1 Introduction

This section of the Scoping Report identifies the potential impacts or risks to shipping and navigation with relevance to the Marine Scheme. Potential impacts or risks will be considered as part of the installation, operation and maintenance and decommissioning phases of the Marine Scheme. This assessment fulfils the requirement of the Preliminary Hazard Analysis (PHA), as required by Annex I of the MCA Marine Guidance Note (MGN)654 (MCA, 2021). The proposed approach to assessing the potential impacts or risk of the Marine Scheme within the supporting Navigation Risk Assessment (NRA) is also outlined.

This section of the Scoping Report should be read in conjunction with the following sections:

- Section 12 Commercial Fisheries; and
- Section 15 Other Sea Users.

13.2 Legislation, Policy and Guidance

In addition to the relevant policy and legislation described in Section 2, the following section outlines the legislation, policy and guidance that will be taken into consideration in relation to the shipping and navigation EIA.

13.2.1 International Legislation

- United Nations Convention on the Law of the Sea (UNCLOS);
- Convention on the International Regulations for Preventing Collisions at Sea (COLREGs), 1974; and
- International Convention for the Safety of Life at Sea (SOLAS) Chapter V, 1974.

13.2.2 National Legislation

UK

- Submarine Telegraph Act 1885.

13.2.3 Guidance

- Marine Guidance Note (MGN) 654 (Merchant and Fishing) Safety of Navigation: Offshore Renewable Energy Installations (OREIs) – Guidance on United Kingdom (UK) Navigational Practice, Safety and Emergency Response and its annexes (Maritime Coastguard agency (MCA, 2021);
- Revised Guidelines for Formal Safety Assessment (FSA) for Use in the Rule-Making Process (IMO, 2018);
- MGN 372 Amendment 1 (Merchant and Fishing) Safety of Navigation: Guidance to Mariners Operating in the Vicinity of UK OREIs (MCA, 2022);
- The RYA Position on Offshore Renewable Energy Developments: Paper 1 (of 4) – Wind Energy (RYA, 2019);

- International Associate of Marine Aids to Navigation (AtoN) and Lighthouse Authorities (IALA) Recommendations O-139 and IALA Guideline G1162 on the Primary Lighting and Marking Guidance Dec 2021 (IALA, 2021); and
- Maritime and Coastguard Agency (MCA) MGN 661 (M+F) Navigation – safe and responsible anchoring and fishing practices (MCA, 2021b).

13.3 Study Area

The shipping and navigation Study Area is defined as a 10 NM buffer around the Marine Scheme (Figure 13-1). The shipping and navigation Study Area is considered large enough to encompass vessel routing activities which have the potential to be impacted, while remaining specific to the Marine Scheme. The shipping and navigation Study Area may be modified for the NRA as part of the EIAR, once the location of the OCS has been refined, and subject to further consultation with relevant maritime stakeholders.

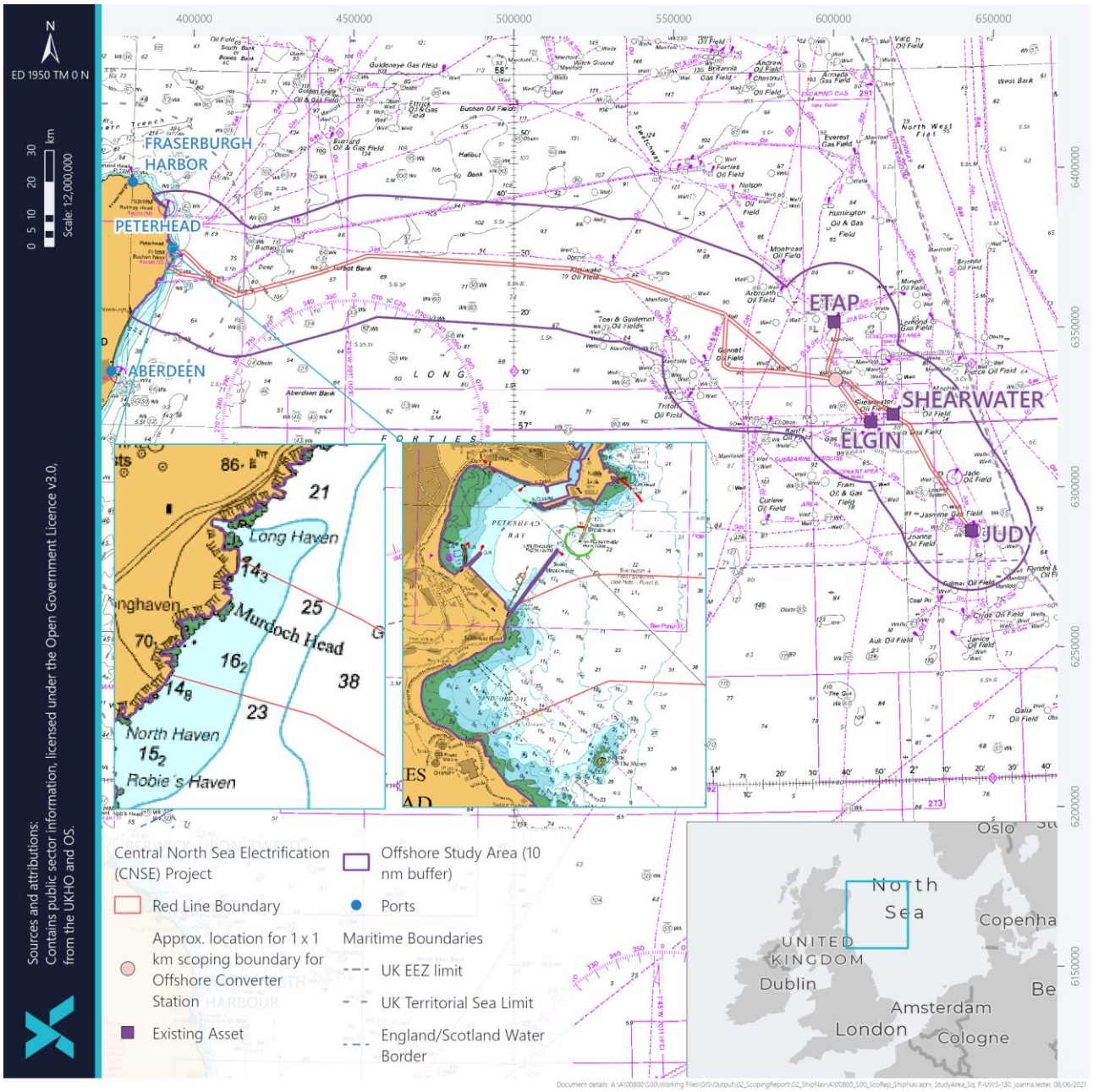

Figure 13-1 Shipping and navigation Study Area

13.4 Key Data Sources

The existing data sets and literature with relevant coverage to the Marine Scheme which have been used to inform this Scoping Report and are proposed to inform the baseline characterisation for the EIA are outlined in Table 13-1.

Table 13-1 Data sources for the shipping and navigation assessment

Name of Source	Description / Link	Author	Date
AIS Data	One year of post COVID terrestrial and satellite data	Anatec	2023
EMODnet Human Activities map viewer	https://emodnet.ec.europa.eu/geoviewer/	European Commission	2023
Admiralty charts	https://www.admiralty.co.uk/charts	UKHO	2023
Admiralty Sailing Directions North Sea	https://www.admiralty.co.uk/publications/publications-and-reference-guides/admiralty-sailing-directions	UKHO	2023
Marine Accident Investigation Branch (MAIB) Incident Data (2012-2022)	https://www.gov.uk/government/organisations/marine-accident-investigation-branch	MAIB	2023
Royal National Lifeboat Institution (RNLI) Incident Data (2008-2021)	https://rnli.org/about-us/our-research/rnli-open-data	RNLI	2023
RYA Coastal Atlas of Recreational Boating	https://marine.gov.scot/information/rya-coastal-atlas-recreational-boating?order=title&sort=desc	RYA	2019
MMO AIS Derived Track Lines	https://www.data.gov.uk/search?filters%5Bformat%5D=&filters%5Bpublisher%5D=Marine+Management+Organisation&filters%5Btopic%5D=&q=AIS&sort=best	Various	2022/23
UK Admiralty Wrecks Database	https://www.gov.uk/guidance/inspire-portal-and-medin-bathymetry-data-archive-centre	UKHO	2023
Search and Rescue Helicopter (SARH) Statistics (2012 – 2022)	https://www.gov.uk/government/statistics/search-and-rescue-helicopter-annual-statistics-year-ending-march-2022/search-and-rescue-helicopter-statistics-year-ending-march-2022#maps-of-sarh-taskings-and-bases	Department of Transport	2021-2022
Crown Estate Scotland Offshore Lease Areas	https://www.crownestatescotland.com/resources/map	Crown Estate Scotland	2023

13.5 Baseline Environment

This section of the Scoping Report characterises the baseline environment through an initial desk-based analysis of the publicly available information sources presented in Table 13-1.

13.5.1 Navigational Features

Navigational features considered to have potential connectivity with the Marine Scheme and shipping and navigation Study Area were identified from a review of regional and site-specific Admiralty Charts (UKHO, 2023). Key navigational

features in the proximity of the Marine Scheme include ports and harbours, offshore renewable energy developments, oil and gas activities and cables and pipelines. There are numerous charted wrecks, and AtoN which will directly interact with the shipping and navigation Study Area. Key navigational features are presented in Figure 13-2.

The Peterhead pilot boarding station is also located in close proximity to the Marine Scheme on the approach to Sandford Bay. Breakwaters shield the Marine Scheme from Peterhead Bay, which contains four RYA Training Centres, a Sailing Club and a marina. Additionally, there is a charted anchorage within the shipping and navigation Study Area at the Bay of Cruden to the south of Peterhead, but the Marine Scheme avoids all charted anchorages.

The closest operational offshore wind development to the Marine Scheme is the Hywind Scotland Pilot Park Offshore Floating Wind Farm. The HVDC Cables for this development will directly interact with both the shipping and navigation Study Area and the Marine Scheme Sandford Bay landfall location. The Hywind Scotland Pilot Park Offshore Wind Farm array area will directly interact with the shipping and navigation Study Area. There is also the potential for the Marine Scheme to interact with the proposed Muir Mhòr Offshore Wind Farm (ScotWind Site 5) and associated cable corridor, as well as the proposed Campion Wind Offshore Wind Farm and associated cable corridor. The proposed Salamander Offshore Wind Farm is located approximately 4 NM to the north of the Sandford Bay landfall location and approximately 6.7 NM to north of the Longhaven landfall location. The Salamander Offshore Wind Farm is located within the shipping and navigation Stidy Area.

The shipping and navigation Study Area overlaps with five oil and gas surface installations in addition to the CNSE Project Assets. These are the Kittiwake, Gannet A, Arbroath, Montrose A and ETAP Quarters and Utilities platforms. 500 m safety zones are permanently in place around these platforms.

There are approximately 132 wrecks/obstructions throughout the shipping and navigation Study Area, eleven of which are within the Marine Scheme. The wrecks associated with the Study Area are pre-dominantly non-dangerous, with approximately 16 unknown wrecks included. There are four dangerous wrecks located within the shallow coastal waters of the shipping and navigation Study Area, these are the Santa Catarina, Xenia, Cairnavon and one unknown. None of these dangerous wrecks are located within the Marine Scheme. Furthermore, there are eight wrecks showing a portion of hull or superstructure within the shipping and navigation Study Area, two of which are within the Marine Scheme (the Zitela and the Constant Star).

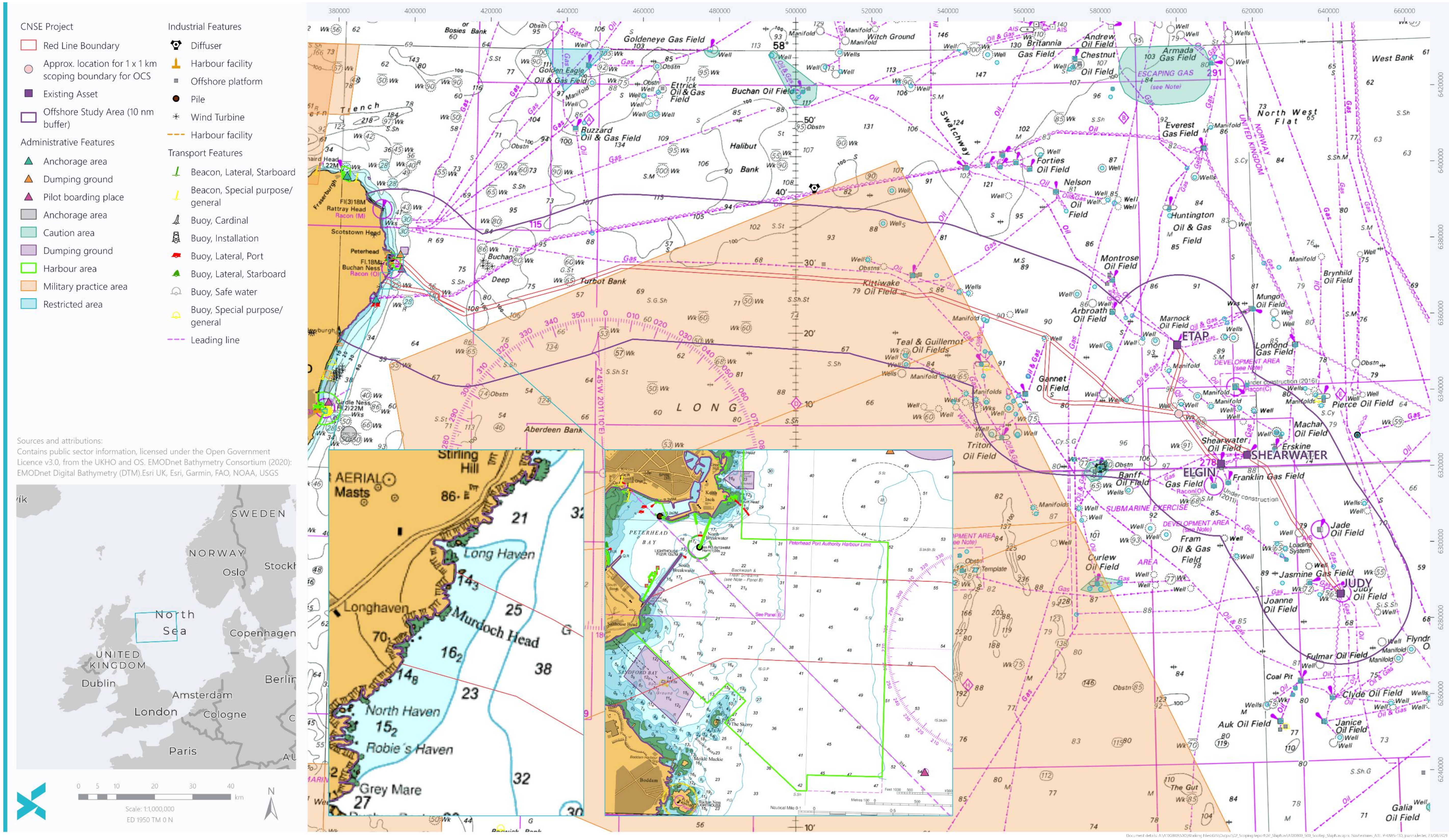

Figure 13-2 Navigational features

13.5.2 Vessel Traffic

In 2019, there were 91,424 total AIS vessel tracks across the year in the shipping and navigation Study Area. In terms of vessel type, 'fishing' vessels represented 25% of tracks in the shipping and navigation Study Area, while 'cargo' and 'unknown[23]' vessels represented 24% each. 'Tanker' and 'Passenger' vessels were the next most represented types in the shipping and navigation Study Area, with 6% each. The remaining 15% of vessels comprised of multiple other vessel types including 'recreational' vessels, and 'high speed craft'. Figure 13-3 presents the AIS vessel movements by vessel type throughout the shipping and navigation Study Area (MMO, 2019).

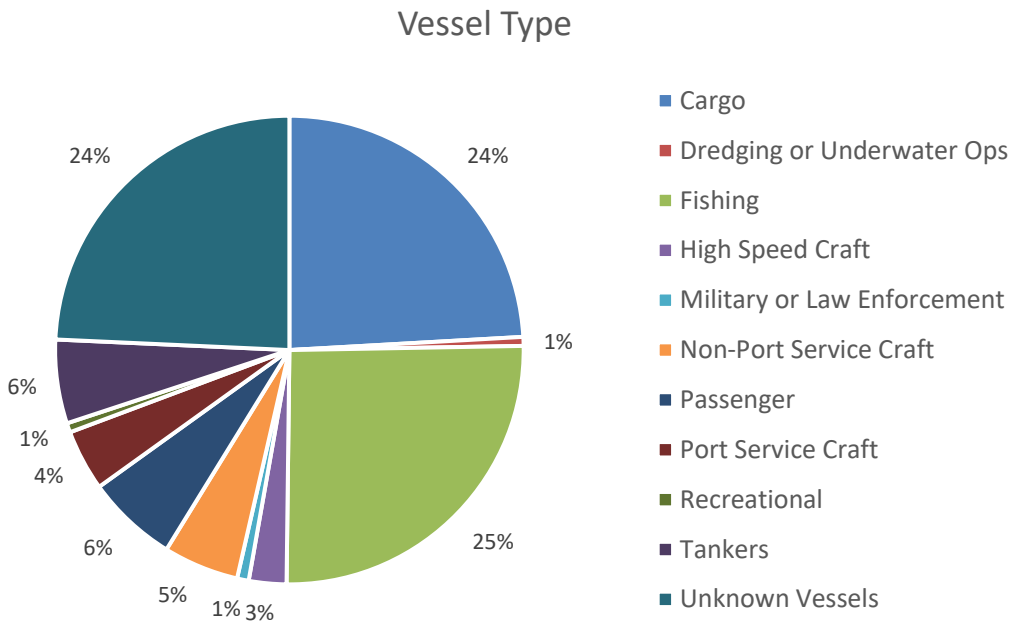

Figure 13-3 Activity by vessel type within the shipping and navigation Study Area

13.5.2.1 Fishing Vessels

Fishing vessels were the most numerous in the shipping and navigation Study Area, although this is likely to be due to Peterhead being the UK's largest fishing port. AIS data identifies a number of key areas (or hotspots) for fishing vessel activity that will directly interact with both the Marine Scheme and shipping and navigation Study Area (Figure 13-4). There is an area of intense fishing activity associated with Peterhead Harbour which extends approximately 16.2 NM offshore. This area of intense activity is located <1 NM to the north of the Marine Scheme Sandford Bay landfall location and 5 NM to the north of the Longhaven Bay landfall location. There are isolated hotspots of fishing activity throughout the shipping and navigation Study Area. AIS data indicates that the majority of fishing vessel activity associated with the shipping and navigation Study Area does not extend more than 32.3 NM offshore. It is acknowledged that fishing vessels less than 15 m in length are typically underrepresented in AIS data.

[23] *Unknown vessels are those which cannot initially be categorised into the other ten categories of vessel type. More detailed analysis during EIA will seek to reduce the % activity attributable to "unknown"*

13.5.2.2 Cargo Vessels

AIS data identifies a number of cargo vessel tracks transiting North, South and East from Peterhead Harbour which will directly interact with the Marine Scheme and shipping and navigation Study Area (Figure 13-4). Cargo vessel activity is concentrated within a route broadly following the coast, associated vessels transiting north or south through the shipping and navigation Study Area. There is a primary cargo vessel route which is associated with vessels transiting to and from Peterhead from the east, which will directly interact with the Marine Scheme. There are an additional two primary routes from Peterhead Harbour, resulting from vessels transiting to and from the north and south, and one primary transit route resulting from vessel traffic to and from Aberdeen Harbour, all of which insect with the shipping and navigation Study Area.

13.5.2.3 Unknown

There are significant areas of vessel traffic throughout the shipping and navigation Study Area categorised as 'unknown'. This activity occurs in significant densities in the coastal waters associated with Peterhead Harbour and the proposed landfall location at Sandford Bay (Figure 13-4). This vessel activity will directly interact with the Marine Scheme in nearshore waters. AIS vessel tracks associated with Peterhead Harbour transit north, south and east, with isolated areas of activity associated with offshore oil and gas installations throughout the North Sea. There are four areas of 'unknown' vessel activity located approximately 1 km to the west of the OCS, one of which has the potential to directly interact with the Marine Scheme.

13.5.2.4 Tankers

There are two key tanker routes resulting from vessels transiting north-south along the coast that will intersect the Marine Scheme and the shipping and navigation Study Area. There are no tanker vessel routes which transit east, although it is noted that some east-west tanker traffic appears to be associated with Aberdeen Harbour. Tanker vessel activity is primarily concentrated in the nearshore area (withing 5.4 NM from the coastline) (Figure 13-4).

13.5.2.5 Passenger Vessels

There is a single area of high-density passenger vessel activity which leaves Aberdeen Harbour and transits north towards Orkney and Shetland (Figure 13-4). This transit route is associated with the NorthLink Aberdeen – Orkney – Shetland ferry service, which transits across the shipping and navigation Study Area and will therefore directly interact with the Marine Scheme. There are no other areas of high-density passenger vessel tracks within the shipping and navigation Study Area.

13.5.2.6 Recreational Vessels

There are isolated areas of recreational vessel activity which are concentrated to the nearshore area. AIS data identifies an area of recreational vessel activity with the shipping and navigation Study Area associated with Peterhead Harbour, which is likely to be associated with vessels transiting to and from Peterhead Marina. It is acknowledged that recreational vessels are typically underrepresented in AIS data.

13.5.2.7 Other

AIS data suggests that there is limited dredging or underwater activity within the shipping and navigation Study Area (Figure 13-4). There are two AIS vessel tracks from Peterhead Harbour, one transiting northeast towards Norway, and one transiting approximately 15 NM east of Peterhead. There is also an area of activity within East of Gannet and Montrose Fields NCMPA ((located approximately 1 km to the west of the OCS), which has the potential to directly

interact with the Marine Scheme. Please note, 'other' vessels include those shown in Figure 13-3. 'Other' includes: dredging or underwater ops; high speed craft; military or law enforcement; non-port service craft; and port service craft.

As a result of the significant oil and gas activity throughout the North Sea, non-port service craft activity is extensive throughout the shipping and navigation Study Area. AIS vessel tracks are primarily associated with Aberdeen Harbour. Activity is concentrated along the coastline between Aberdeen and Peterhead and around offshore oil and gas installations. There is the potential for non-port service craft activity to directly interact with the shipping and navigation Study Area and the Marine Scheme within the nearshore environment. The potential for interaction between the Marine Scheme and non-port service craft activity associated with oil and gas installations is reduced through the implementation of 500 m safety zones around these platforms.

There is limited high speed craft activity throughout the shipping and navigation Study Area, AIS data identified a single vessel track transiting approximately 14.5 NM east from Peterhead Harbour. This high-speed craft activity will not directly interact with the Marine Scheme.

13.5.3 Vessel Density

Throughout the shipping and navigation Study Area, the highest vessel densities (vessel counts per years) are recorded in waters of within approximately 32.4 NM of the coastline, with the highest densities recorded between 0 and 10.8 NM (Figure 13-5). Between 32.4 NM and the OCS and Assets, vessel density is low to moderate, with activity hotspots associated with offshore oil and gas infrastructure (including around the Assets). It is acknowledged that terrestrial AIS data coverage may reduce with distance offshore. This will be addressed within the NRA by ensuring that both satellite and terrestrial data are used to inform the assessment.

13.5.4 Historical Incident Data

A review of reports from the MAIB incident data from 2012 to 2022 indicated that three incidents (involving four vessels) were recorded within the shipping and navigation Study Area, however these incidents do not directly interact with the Marine Scheme. The vessel types that were involved in these incidents include two fishing vessels, a general cargo vessel and an oil bunker barge. These incidents involved the disappearance and rescue of a small fishing vessel, a collision, and a crush incident (which resulted in the loss of 1 life) (MAIB, 2015; MAIB, 2016; MAIB, 2021; MAIB, 2023).

An analysis of the RNLI incident data from 2018-2022 indicates that approximately 86 call outs were recorded within the shipping and navigation Study Area, with approximately 43 of these incidents directly interacting with the Marine Scheme. Of the total 86 call outs, the casualty category included Unknown (26%), People (20%), Leisure (13%), Commercial (35%) and Other (6%). The Abbreviates Incident Category (AIC) for these call outs include commercial fishing, person in distress, sailing, power boat, false alarm and unknown. The lifeboat stations from which these call outs originate are Peterhead and Fraserburgh (RNLI, 2023).

Search and Rescue (SAR) helicopter tasking associated with the shipping and navigation Study Area are associated with the Sumburgh Base and Inverness Base. In the year ending March 2022, 170 taskings were called out from the Sumburgh Base (four of which are associated with the shipping and navigation Study Area in the region of the OCS

and Assets) and 366 from the Inverness Base (three of which are associated with the shipping and navigation Study Area in the region of the OCS and Assets and two which directly interact with the Marine Scheme at the Sandford Bay landfall location).

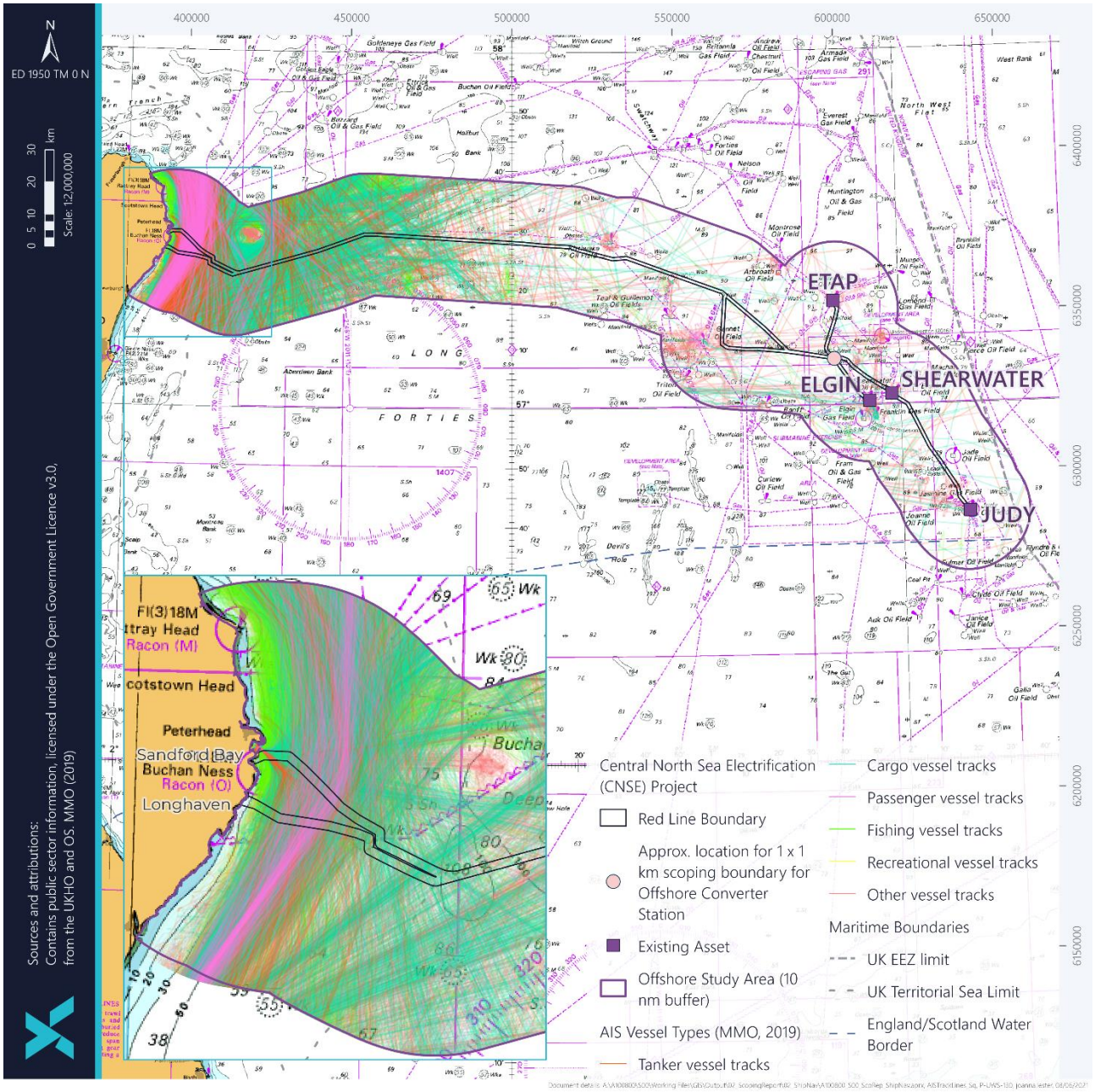

Figure 13-4 AIS vessel tracks

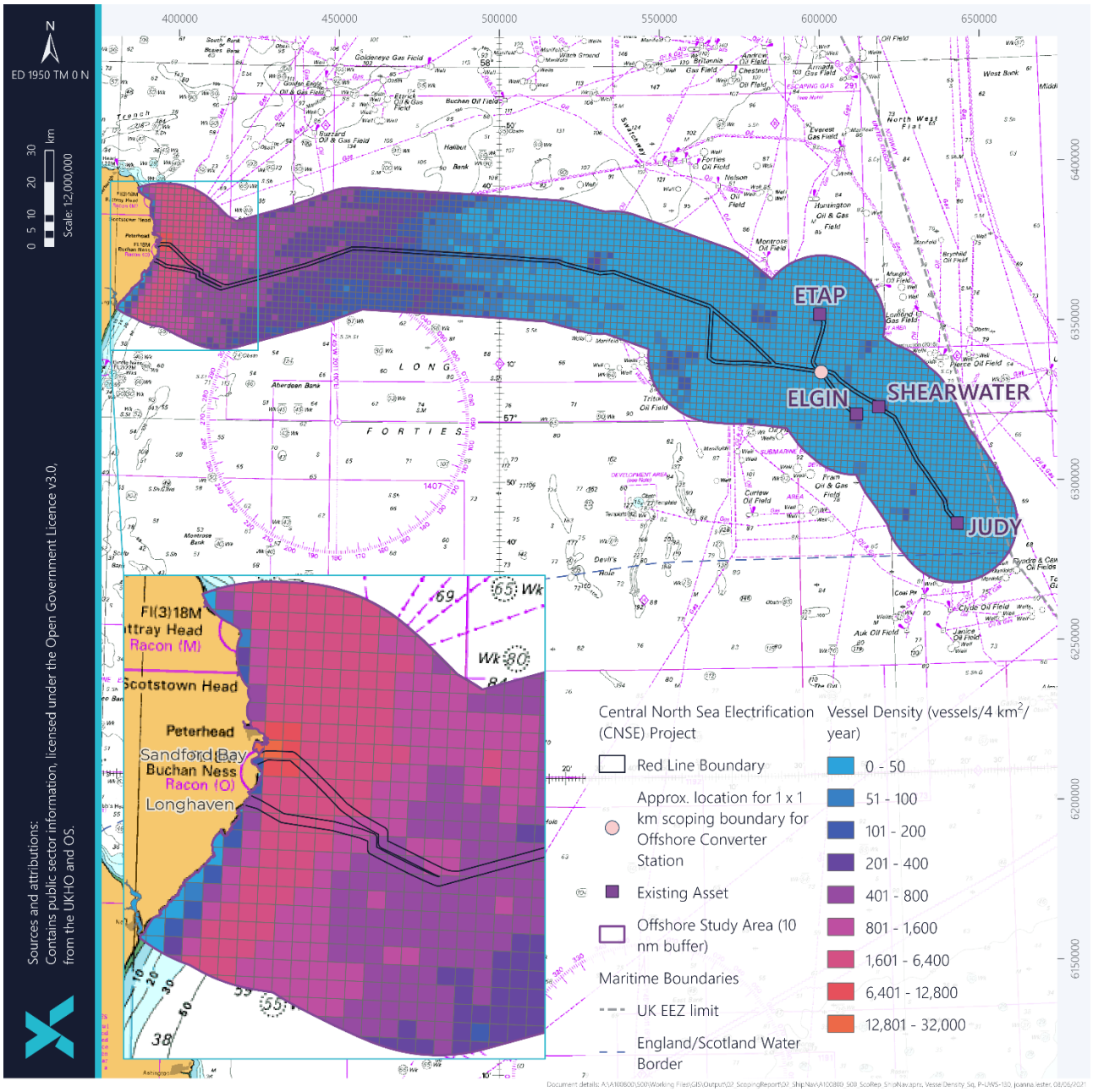

Figure 13-5 Vessel Density

13.6 Embedded Mitigation

At this stage topic-specific measures have not been developed; however, certain measures have been proposed as part of the development process in line with industry best-practice to reduce the potential for impacts to shipping and navigation receptors (Table 13-2). The embedded mitigation specific to shipping and navigation receptors will be agreed upon by the Applicant and will be detailed within the EIAR. Unless otherwise indicated, the mitigation measures will be secured through the ML consent conditions.

Table 13-2 Embedded mitigation measures

Embedded Mitigation Measure	Form (Primary or Tertiary)
Develop and implement a CEMP, including a Marine Pollution Contingency and Control Plan.	Tertiary
Appropriate marking of all infrastructure associated with the Marine Scheme on UKHO Admiralty Charts.	Tertiary
Production of a compass deviation report will be produced prior to the commencement of any installation works.	Tertiary
Marking and lighting of the site in agreement with the NLB and in line with International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Recommendation G1162 (IALA, 2021).	Primary
Compliance with MGN 654 and its annexes and completion of an SAR checklist where applicable.	Tertiary
Applications for statutory safety zones of up to 500 m will be made for the installation of the OCS (this is secured under the Energy Act 2004).	Tertiary
Non statutory 500 m advisory safe passing distances will be implemented around installation vessels and associated work areas.	Tertiary
Promulgation of information for vessel routes, timings and locations or activities, safety zones and advisory passing distances as required via Notices to Mariners, Kingfisher Bulletins, radio navigation warnings, NAVTEX and/or broadcast warnings.	Tertiary
Compliance with MARPOL, COLREGs and SOLAS regulations.	Tertiary
Presence of guard vessels during installation.	Tertiary
All Marine Scheme vessels are to be equipped with appropriate markings and lights and will always broadcast their status on AIS.	Primary
A FLO will be appointed and consultation with fisheries working group(s) will be maintained throughout the installation phase to ensure that information relating to the Marine Scheme is disseminated efficiently. Dialogue will be maintained with the commercial fishing industry and access to home ports is maintained during the main fishing season.	Tertiary

13.7 Scoping of Impacts

The shipping and navigation assessment will consider the installation, operation, maintenance and decommissioning of the Marine Scheme. Details of each of these stages are set out in Section 3 Project Description.

The potential for the Marine Scheme to result in the potential significant effects described in this section takes into account the embedded mitigation measures described in Section 13.6.

13.7.1 Sources and Impacts

This section identifies the sources and impacts that would occur as a result of the installation, operation, maintenance and decommissioning of the Marine Scheme.

Potential impacts to shipping and navigation have been mitigated as far as practicable through avoidance of the main navigational features in the area such as charted anchorages, maintained channel depths and prohibited regions. However, it is not possible for the Marine Scheme to avoid all marine navigation areas. Preliminary identification therefore provides the key impacts to shipping and navigation, summarised in Table 13-3 with the sources of impacts from the project phases listed below:

13.7.1.1 Sources of Installation Impacts

- Installation vessel presence / activities lead to vessel collisions;
- Installation activities present disruption to vessels using the area; and
- Installation activities introduce subsurface hazards.

13.7.1.2 Sources of Operational Impacts

- Subsea cable presents snagging hazard to anchoring;
- Subsea cable presents snagging hazard to seabed fishing;
- Reduction in under keel clearance;
- Presence of the OCS; and
- Electromagnetic field effects from operation of subsea power cables leading to magnetic compass deviations.

13.7.1.3 Sources of Maintenance Impacts

- Maintenance vessel presence / activities lead to vessel collisions;
- Maintenance activities present disruption to vessels using the area; and
- Maintenance activities introduce subsurface hazards.

13.7.1.4 Sources of Decommissioning Impacts

- Decommissioning vessel presence / activities lead to vessel collisions;
- Decommissioning activities present disruption to vessels using the area; and
- Decommissioning activities introduce subsurface hazards.

13.7.1.5 Potential Impacts

Table 13-3 identifies the potential impacts that could result from the sources identified above.

Table 13-3 Sources and impacts

Source	Impact	Potential for Significant Effects	Proposed to be Scoped In/Out
Installation, Maintenance and Decommissioning			
Vessel presence	Increased risk of vessel collisions	Yes	Scoped in
Installation, maintenance and decommissioning activities present disruption to vessels using the area	Risk of disruption to vessels using the area	Yes	Scoped in
Installation, maintenance and decommissioning activities introducing new subsurface hazards	Risk of vessels fouling new unmarked subsurface hazards	Yes	Scoped in
Operation			
Presence of cable	Presents potential snagging hazard to anchoring	Yes	Scoped in
Presence of cable	Presents potential snagging hazard to seabed fishing	Yes	Scoped in
Presence of cable and associated external protection measures	Potential reduction in under keel clearance	Yes	Scoped in
Presence of energised cables producing electromagnetic field	Potential to lead to magnetic compass deviations	Yes	Scoped in
Presence of OCS	Potential allision risk	Yes	Scoped in

13.7.2 Impacts Pathways

This section identities whether there are any impact pathways from the impacts identified above that could give rise to potentially significant effects on the receptors within the shipping and navigation Study Area.

Table 13-4 identifies the potential impacts pathways to shipping and navigation from all phases and identifies which are proposed to be scoped in or out of the assessment.

Table 13-4 Impact pathways with receptors

Impact Pathway	Receptors	Potential for Significant Effects	Proposed to be Scoped In/Out
Displacement resulting in increased vessel-to-vessel collision risk between third-party vessels during installation, operation and maintenance and decommissioning phases	All vessel types	Limited potential to result in significant effect due to limited temporal and spatial presence of project vessels during all phases	Scoped out
Third-party to project vessel collision during all phases	All vessel types	The Marine Scheme is within a region where shipping activity is high, therefore has potential to result in a significant effect	Scoped in
Deviation from established and identified vessel routes and areas during installation, maintenance and decommissioning phases	All vessel types	While the Marine Scheme is within a region where shipping activity is high, displacement from established routes due to vessel presence during installation, maintenance and decommissioning phases will be limited in the context of available sea room. As such significant effects are not anticipated.	Scoped out
Interaction with fishing gear during all phases	Fishing vessels	Fishing vessel tracks are present within shipping and navigation Study Area therefore has	Scoped in

Impact Pathway	Receptors	Potential for Significant Effects	Proposed to be Scoped In/Out
		potential to result in a significant effect	
Interaction with vessel anchors and anchoring activity during all phases	All vessel types	The Marine Scheme is within a region where shipping activity is high, therefore has potential to result in a significant effect	Scoped in
Reduction in under keel clearance resulting from laid cable and associated protection during operation phase	All vessel types	The Marine Scheme is within a region where shipping activity is high, therefore has potential to result in a significant effect	Scoped in
Interference with marine navigational equipment during operation phase	All vessel types	The Marine Scheme is within a region where shipping activity is high, therefore has potential to result in a significant effect	Scoped in
Presence of a new offshore structure resulting from the installation of the OCS	All vessel types	A new offshore structure has the potential to increase the risk of allision with vessels operating in the area.	Scoped in

13.8 Proposed EIA Methodology

13.8.1 Proposed Data Sources

The following data sources are proposed to be used to inform the assessment:

- One year of AIS data (terrestrial and satellite);
- VMS data from the MMO;
- Marine Themes Administrative theme data (OceanWise);
- Admiralty Sailing Directions North Sea Pilot (12th Edition) (UKHO, 2021);
- Admiralty charts (UKHO);
- Offshore renewables lease data (The Crown Estate Scotland, 2023);
- UK wrecks and obstructions data (UKHO, 2023);
- Oil and gas surface structures and pipelines data (NSTA, 2023);
- RYA Coastal Atlas of Recreational Boating (RYA, 2019);

- MAIB incident data (MAIB, 1992 – 2022);
- RNLI incident data (RNLI, 2008 – 2022); and
- SARH taskings data (Dept for Transport & MCA, 2016 – 2022).

13.8.2 Assessment Methodology

An NRA shall be undertaken to understand and address the potential effects of the Marine Scheme on shipping and navigation. The NRA will inform the shipping and navigation assessment section within the EIAR. The NRA will comprise the following key components:

- Marine Traffic Survey (MTS);
- Consultation; and
- Formal Safety Assessment (FSA).

13.8.2.1 Marine Traffic Survey

To provide a detailed understanding of shipping activity in the shipping and navigation Study Area, a MTS will be undertaken as part of the NRA and shall identify navigational features and patterns of vessel activity within the vicinity of the Marine Scheme, to establish baseline conditions to inform the subsequent FSA.

The MTS shall acquire detailed AIS data for the region, with the following temporal and spatial extent:

- A proposed time period of one year of recent (post-COVID) AIS data;
- A 10 NM wide Study Area (5 NM buffer) around the proposed Marine Scheme (unless otherwise reduced following consultation with relevant stakeholders).

The IMO requires that; all ships of ≥300 gross tonnage engaged on international voyages, cargo vessels of ≥ 500 gross tonnage not engaged on international voyages, and all passenger ships regardless of size built on or after 1st July 2002, are fitted with an AIS. All UK registered fishing vessels, and fishing vessels operating in UK waters of length 15 m and above are required to carry AIS equipment. Smaller fishing vessels (below 15 m) as well as recreational craft are not required to carry AIS but a proportion does so voluntarily, however these are likely to be under represented in the AIS data.

The AIS data will be used to assess the patterns and intensity of shipping activity in the vicinity of the Marine Scheme. Due to the likely under representation of small fishing and recreational vessels in the AIS data, additional data sources including VMS data, the RYA Coastal Atlas, and consultation will be used to validate the findings of the AIS analysis.

Additional analysis shall consider key navigational features which will be extracted from additional sources of data such as:

- Publicly available historic AIS vessel traffic data;
- Fishing vessel traffic data (VMS and AIS), noting that additional information on fishing traffic will be available from the Commercial Fisheries assessment (Section 12);
- Admiralty charts for the area;

- Maritime incident data in the area (RNLI, SARH and MAIB);
- The RYA UK Coastal Atlas of Recreational Boating; and
- Sailing and Pilot books.

13.8.2.2 Stakeholder Consultation

Consultation with key maritime stakeholders relevant to the location of the Marine Scheme's will be undertaken to inform the baseline understanding of shipping in the area and also to obtain supplementary information which may not be available through the data sources outlined above.

Parties consulted will include, but may not be limited to:

- Maritime and Coastguard Agency (MCA);
- NLB;
- UK Chamber of Shipping;
- RYA Scotland;
- Cruising Association (CA);
- SFF;
- Regular runner vessel operators – identified from the MTS;
- RNLI; and
- Local port authorities (including Aberdeen, Peterhead and Fraserburgh).

Pre-Scoping stakeholder engagement has taken place between the Applicant, the MCA and the NLB with a view to maintaining open and effective communications going forward. A project overview meeting was held on 2nd March 2023.

Consultee input shall be incorporated where appropriate into the NRA such that concerns, and impacts are recorded and addressed.

13.8.2.3 Formal Safety Assessment

The FSA process provides a systematic method for evaluating and controlling risk, within a structured framework. Baseline shipping patterns and navigational features along with stakeholder consultations provide the basis for establishing potential hazards, or impacts. These impacts are then characterised in their magnitude and likelihood, which ultimately provides for risk categorisation against a risk matrix.

Additional control or mitigation measures are then identified to provide a reduction in risk. The residual effects are assessed to determine risk acceptability in accordance with the principles of ALARP (As Low As Reasonably Practicable). Where necessary or appropriate, mitigation measures are assessed to determine/justify an ALARP position.

The FSA comprises the following components:

- Hazard identification;
- Risk assessment;
- Identification of additional mitigation measures;
- Cost-benefit analysis;
- Risk assessment table; and
- Cumulative effects and future case.

These components will be detailed in the following sections.

Hazard identification

Taking into account the Marine Scheme components and activities, baseline information provided in the MTS, consultation responses and expert judgement/industry experience, a list of relevant impacts to marine navigation shall be compiled as a desktop exercise. The list shall be captured in a table and retained as an auditable hazard log. Hazards relating to separate Marine Scheme phases shall be identified.

Risk assessment

The risk assessment process is implemented using a classic risk matrix approach. Each hazard/impact is individually evaluated against specific criteria and assigned categories for 'severity of consequence' (Magnitude) and 'frequency of occurrence' (Likelihood). This assessment of risk shall be conducted in consideration of the embedded mitigation outlined in Section 13.6.

The risk assessment categorisations directly reflect the UK Health and Safety Executive principles of ALARP. The approach is consistent with relevant marine guidance from the IMO and the UK MCA, as outlined in Section 13.2. The definitions of the categories for outcome severity / magnitude and the frequency or likelihood are captured in Table 13-5 and Table 13-6 respectively.

The likelihood and consequence categories are combined for each hazard/impact using the risk matrix shown in Table 13-7, which is used to derive a risk tolerability level of either Unacceptable, Tolerable or Broadly Acceptable, with unacceptable or tolerable risks being considered to be significant in EIA terms. Definitions of each risk tolerability level are provided in Table 13-8.

Table 13-5 Severity of consequence ranking definitions

Rank	Description	Definition			
		People	Property	Environment	Business
1	Negligible	No perceptible effect	No perceptible effect	No perceptible effect	No perceptible effect
2	Minor	Slight injury(s)	Minor damage to property i.e., superficial damage	Tier 1 Local assistance required	Minor reputational impact – limited to users
3	Moderate	Multiple moderate or single serious injury	Damage not critical to operations	Tier 2 Limited external assistance required	Local reputation impacts

Rank	Description	Definition			
		People	Property	Environment	Business
4	Serious	Serious injury or single fatality	Damage resulting in critical impact on operations	Tier 2 Regional assistance required	National reputation impacts
5	Major	More than 1 fatality	Total loss of property	Tier 3 National assistance required	International reputational impacts

Table 13-6 Frequency of occurrence ranking definitions

Rank	Description	Definition
1	Negligible	<1 occurrence per 10,000 years
2	Extremely Unlikely	1 per 100 – 10,000 years
3	Remote	1 per 10 – 100 years
4	Reasonably Probable	1 per 1 – 10 years
5	Frequent	Yearly

Table 13-7 Tolerability matrix and risk rankings

Severity of Consequence	Negligible	Extremely Unlikely	Remote	Reasonably Probable	Frequent
Major	Broadly Acceptable	Tolerable	Unacceptable	Unacceptable	Unacceptable
Serious	Broadly Acceptable	Tolerable	Tolerable	Unacceptable	Unacceptable
Moderate	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable	Unacceptable
Minor	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable
Negligible	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable
	Frequency of Occurrence				

Table 13-8 Tolerability definitions

Tolerability	Definition
Broadly Acceptable (Low Risk - not significant)	Generally regarded as acceptable and adequately controlled. At these risk levels the opportunity for further reduction is limited.
Tolerable (Moderate Risk - significant unless ALARP)	Typical of the risks from activities which people are prepared to tolerate to secure benefits. There is however an expectation that such risks are properly assessed, appropriate mitigation measures are in place, residual risks are ALARP and that risks are periodically reviewed to monitor if further controls are appropriate.
Unacceptable (High Risk - significant)	Generally regarded as unacceptable whatever the level of benefit associated with the activity. Significant risk mitigation or design modification required to reduce to tolerable (ALARP).

13.8.2.4 Identification of Additional Control Measures

Where risks are assessed as being unacceptable or tolerable (significant) after factoring in the embedded mitigation measures already identified, further additional risk control measures are identified and considered. A residual risk assessment is then conducted, considering any additional control measures.

13.8.2.5 Cost Benefit Analysis

In order to formulate recommendations for decision-making, any additional risk mitigation measures identified are subjected to a qualitative cost-benefit comparison in order to justify the measure and establish a residual risk categorisation and basic ALARP position.

13.8.2.6 Risk Assessment Table

The Risk Assessment shall be captured in a table such that the hazards and impacts for each of the Marine Scheme phases and the relevant embedded mitigation measures and any additional mitigation measures identified, are captured to provide an auditable hazards and effects register or log shown in Table 13-9.

Table 13-9 Hazard and effects register example

Hazard/ Impact	Collision
Phase	Installation
Embedded Mitigation Measures	Notice to Mariners COLREGs
Causes	Human Error
Consequence	High
Likelihood	Remote
Risk	Tolerable
Additional Mitigation Measures	Specific Procedures
Cost Benefit Analysis	Measure Justified
Residual Risk	Tolerable ALARP

13.8.2.7 Cumulative Effects and Future Case

Cumulative effects and future case will be included by review of future projects potentially affecting or influencing the shipping and navigation Study Area and the wider general area and assumption of a general increase in traffic density, considering the future baseline as noted in Section 12.5.5. A list of potential projects and activities shall be compiled and is expected to include windfarms and offshore industry activities in the region. Each hazard/impact will be qualitatively reviewed against the potential direct and indirect cumulative effects from any of the projects listed. Any issues shall be captured, and further risk mitigation measures considered where deemed appropriate.

13.8.3 Conclusion

The Marine Scheme presents a potential impact to shipping and navigation, as such the NRA shall be based on real shipping patterns and navigational features, from up-to date AIS data and publicly available navigational information and will cover the installation, operation and maintenance and decommissioning phases.

The assessment shall be centred around an FSA in line with relevant marine guidance and UK HSE principles of ALARP. The approach ultimately aims to identify effects on shipping such as collision and disruption such that they are recorded, auditable and effectively managed.

A summary of the proposed scope of the assessment is provided in Table 13-10.

Table 13-10 Proposed scope of the assessment

Receptor	Potential for significant effect	Project phase(s)	Proposed to be scoped in/out
All vessel types	Displacement resulting in increased vessel-to-vessel collision risk between third-party vessels	Installation Operation Maintenance Decommissioning	Scoped out
All vessel types	Third-party to project vessel collision	Installation Operation Maintenance Decommissioning	Scoped in
All vessel types	Deviation from established and identified vessel routes and areas	Installation Maintenance Decommissioning	Scoped out
Fishing vessels	Interaction with fishing gear	Installation Operation Maintenance Decommissioning	Scoped in
All vessel types	Interaction with vessel anchors and anchoring activity	Installation Operation Maintenance Decommissioning	Scoped in
All vessel types	Reduction in under keel clearance resulting from laid cable and associated protection	Operation	Scoped in
All vessel types	Compass deviation resulting from EMF	Operation	Scoped in
All vessel types	Presence of a new offshore structure resulting from the installation of the OCS	Operation	Scoped in

13.9 Scoping Questions

The Applicant would request responses to the Greenfield scoping questions of relevance to Section 13. Shipping and Navigation. Please respond to Questions 7-14 in Table 1-2.

13.10 Shipping and Navigation: Brownfield

The Petroleum Act 1987 governs offshore safety zones which are established automatically around all offshore oil and gas installations that project above the sea. Vessels of all nations are required by law to respect safety zones and it is an offence (under section 23 of the Petroleum Act 1987) to enter a safety zone except under special circumstances.

Given that shipping and navigation activity is already excluded from the 500 m safety zone of each Asset, the activity associated with the Brownfield Scope (cable and cable protection installation and O&M) will not have any additional impact on shipping and navigation receptors.

For the two Assets where BLPs may be installed, installation would enlarge the existing 500 m safety zone, such that the zone extends to every point within 500 m of any part of the Asset. Variation of the existing Consent to Locate (granted under Part 4A of the Energy Act 2008) will consider any additional risk to shipping and navigation receptors. Any risk would result from temporary and localised vessel activity in the vicinity of the 500 m safety zones during BLP installation.

It is therefore proposed that shipping and navigation receptors can be scoped out of further assessment associated with the Brownfield Scope.

Embedded mitigation relevant to shipping and navigation (Section 13.6) will be applied to the activities associated with the Brownfield Scope.

The Offshore Installation Manager is responsible for ensuring co-ordination of vessel activity within the safety zone (i.e. directly associated with the Asset), but this will not impact general shipping and navigation activity.

13.10.1 Brownfield Scoping Questions

The Applicant would request responses to the Brownfield scoping questions of relevance to Section 13. Shipping and Navigation. Please respond to Question 5 and 7 in Table 1-3.

13.11 References

European Commission. 2023. EMODnet Human Activities map viewer. Available online at: https://emodnet.ec.europa.eu/geoviewer/

MAIB. 2015. Disappearance and rescue of small fishing vessel Water-rail. Available online at: https://www.gov.uk/maib-reports/disappearance-and-rescue-of-small-fishing-vessel-water-rail-in-the-north-sea

MAIB. 2016. Collision between general cargo vessel Daroja and oil bunker barge Erin Wood. Available online at: https://www.gov.uk/maib-reports/collision-between-general-cargo-vessel-daroja-and-oil-bunker-barge-erin-wood

MAIB. 2021. Crush incident on scallop dredger Olivia Jean with loss of 1 life. Available online at: https://www.gov.uk/maib-reports/crush-incident-on-scallop-dredger-olivia-jean-with-loss-of-1-life

MAIB. 2023. Marine Accident Investigation Branch (MAIB) Incident Data. Available online at: https://www.gov.uk/government/organisations/marine-accident-investigation-branch

Maritime and Coastguard Agency. 2021. MGN 654 (M+F) Offshore Renewable Energy Installations (OREI) Safety Response. Available online at: https://www.gov.uk/government/publications/mgn-654-mf-offshore-renewable-energy-installations-orei-safety-response

MMO, 2019. Anonymised AIS Derived Track Lines. Available online at: https://environment.data.gov.uk/DefraDataDownload/?mapService=MMO/AnonymisedAISderivedTrackLines2019&mode=spatial#{CopyrightUrl}

RNLI. 2023. Royal National Lifeboat Institution (RNLI) Incident Data. Available online at: https://rnli.org/about-us/our-research/rnli-open-data

RYA. RYA Coastal Atlas of Recreational Boating. Available online at: https://marine.gov.scot/information/rya-coastal-atlas-recreational-boating?order=title&sort=desc

UKHO. 2023. Admiralty charts. Available online at: https://www.admiralty.co.uk/charts

UKHO. 2023. Admiralty sailing directions North Sea. Available online at: https://www.admiralty.co.uk/publications/publications-and-reference-guides/admiralty-sailing-directions

14 MARINE ARCHAEOLOGY

14.1 Introduction

This section of the Scoping Report identifies the sensitivities associated with marine archaeological receptors of relevance to the Marine Scheme and considers the potential impacts arising from installation, operation and maintenance and decommissioning of the Marine Scheme.

This section of the Scoping Report should be read in conjunction with the following section:

- Section 6 Physical Environment.

Marine historic assets are defined in the Marine (Scotland) Act 2010 (section 73, paragraph 5) as vessels, vehicles, aircraft, parts of such, contents of such, buildings and other structures, caves, deposits, artefacts or any other thing or groups of things that evidence previous human activity.

14.2 Legislation, Policy and Guidance

In addition to the relevant policy and legislation described in Section 2, the following section outlines the legislation, policy and guidance that will be taken into consideration in relation to the marine archaeology EIA.

14.2.1 International Legislation and Policy

- The United Nations Convention of the Law of the Sea (UNCLOS);
- Annex to the UNESCO Convention on the Protection of the Underwater Cultural Heritage 2001;
- International Council of Monuments and Sites (ICOMOS) Charter on the Protection and Management of Underwater Cultural Heritage (1996) (the Sofia Charter); and
- The European Convention on the Protection of the Archaeological Heritage (revised), known as the Valletta Convention.

14.2.2 National Legislation

UK

- The Protection of Military Remains Act 1986 (PoMRA);
- The Protection of Wrecks Act 1973;
- The Ancient Monuments and Archaeological Areas Act 1979 (as amended); and
- The Merchant Shipping Act 1995.

14.2.3 National Policy

- The Historic Environment Policy Statement for Scotland. 2019.

14.2.4 Guidance

- Historic Environment Scotland Designation Policy and Selection Guidance. 2019;
- Historic Environment Scotland Managing Change in the Historic Environment Guidance Series: Setting (revised in 2020);
- The Chartered Institute for Archaeologists (CIfA) Codes, Standards and Guidance (various) https://www.archaeologists.net/codes/cifa;
- Historic Environment Scotland. 2016, updated 2020. Managing Change in the Historic Environment guidance series;
- Scottish Natural Heritage & Historic Environment Scotland. 2018. Environmental Impact Assessment Handbook: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment process in Scotland. V5. Edinburgh;
- The Joint Nautical Archaeology Policy Committee (JNAPC) and Crown Estate. 2006. Maritime Cultural Heritage & Seabed Development: JNAPC Code of Practice for Seabed Development. York: CBA;
- Wessex Archaeology. 2007. Historic Environment Guidance for the Offshore Renewable Energy Sector, commissioned by COWRIE Ltd (project reference ARCH-11-05);
- Oxford Archaeology & George Lambrick Archaeology and Heritage. 2008. Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy, commissioned by COWRIE Ltd (project reference CIARCH-11-2006);
- The Crown Estate. 2021 Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects Offshore Renewables Projects, Wessex Archaeology Ltd for The Crown Estate;
- The Crown Estate. 2014. Protocol for Archaeological Discoveries: Offshore Renewables Projects, Wessex Archaeology Ltd for The Crown Estate;
- English Heritage (now Historic England), 1998. Identifying and Protecting Palaeolithic Remains: Archaeological Guidance for Planning Authorities and Developers;
- English Heritage (now Historic England), 2002. Military Aircraft Crash Sites: Guidance on their significance and future management;
- English Heritage (now Historic England). 2012. Ships and Boats: Prehistory to Present. Designation Selection Guide. Swindon: English Heritage;
- Wessex Archaeology. 2011. Assessing Boats and Ships 1860-1913, 1914-1938 and 1939-1950. Archaeological Desk-Based Assessments in 3 volumes. Salisbury: Wessex Archaeology; and
- Scottish Government, 2014. Our Place in Time. The Historic Environment Strategy for Scotland (the document is currently being updated and is out to consultation).

14.3 Study Area

The marine archaeology Study Area is defined as the Marine Scheme with a 500 m buffer in each direction (Figure 14-1). This encompasses the area that will be directly impacted by the HVDC Cables, the HVAC Cables and the OCS.

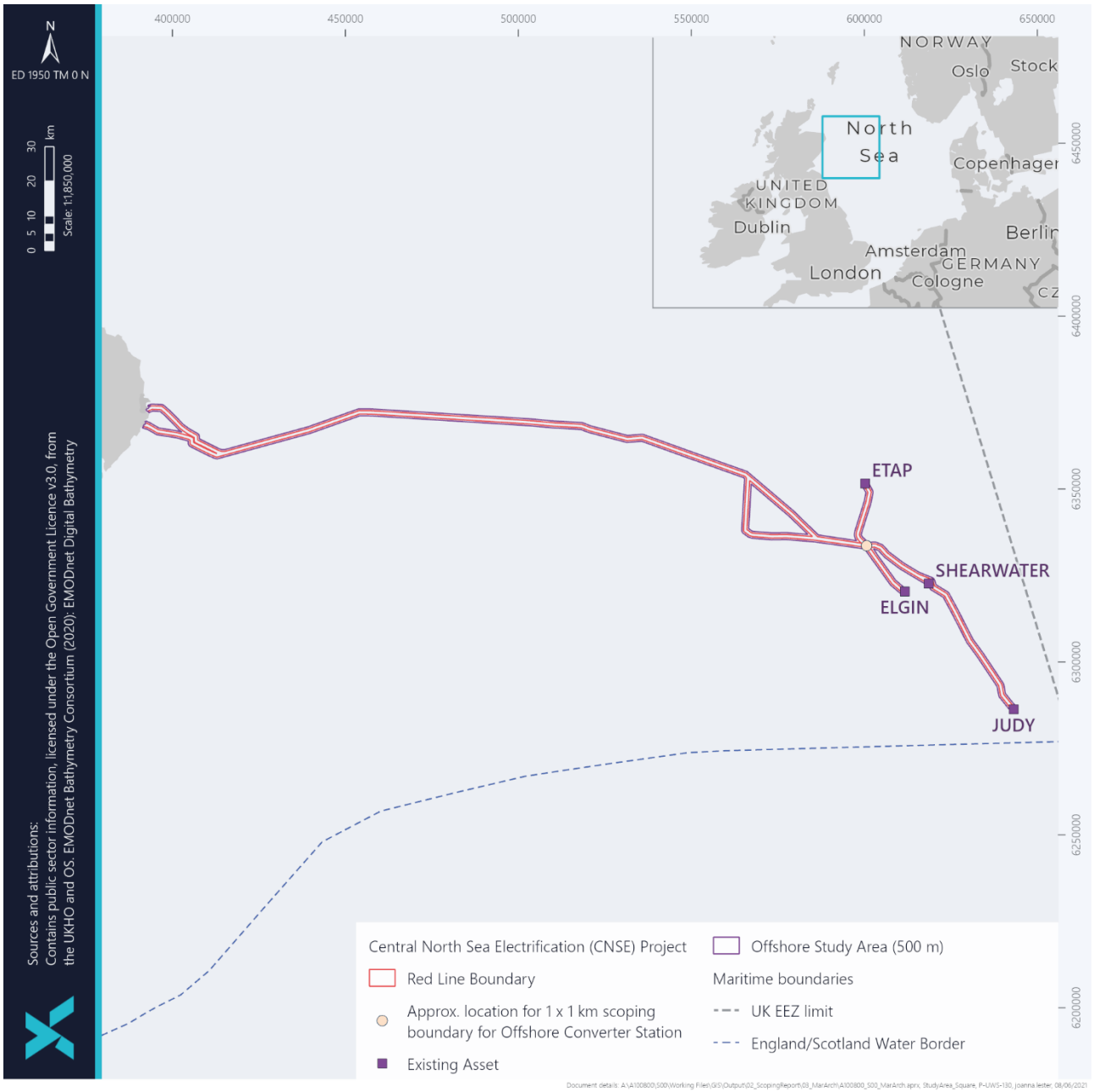

Figure 14-1 Marine archaeology Study Area

14.4 Key Data Sources

The existing data sets and literature with relevant coverage to the Marine Scheme, which have been used to inform this Scoping Report and are proposed to inform the baseline characterisation for the EIA are outlined in Table 14-1.

Table 14-1 Data sources for the marine archaeological assessment

Name of Source	Description/ Link	Author	Date
The National Record of the Historic Environment (NRHE) of Scotland	Canmore (https://canmore.org.uk/) and Pastmap database (http://pastmap.org.uk/)	Historic Environment Scotland (HES)	ongoing
Historic Environment Record	Aberdeenshire HER (https://online.aberdeenshire.gov.uk/smrpub/)	Aberdeenshire Council Archaeology Service	ongoing
UKHO wreck register & nautical charts	https://www.admiralty.co.uk/digital-services/data-solutions/admiralty-marine-data-portal	UKHO	2023
Statutory lists, registers and designated areas, including Lists of Scheduled Monuments, Listed Buildings and Historic Marine Protected Areas	The Historic Environment Scotland Data Portal https://portal.historicenvironment.scot/	HES	ongoing
Off Scotland: a comprehensive record of maritime and aviation losses in Scottish waters	Edinburgh: C-Anne Publishing.	Whittaker, I.G.	1998
The Ship Wreck Index of Great Britain & Ireland Vol.4 Scotland	London: Lloyd's Register of Shipping.	Larn, R., and Larn, B.	1998
Europe's Lost Frontiers: Volume 1	https://www.archaeopress.com/Archaeopress/download/9781803272689	Gaffney, V., and Fitch S.	2022

14.5 Baseline Environment

This section will consider all relevant archaeological points of interest including maritime artifacts, aviation artifacts, seabed prehistory, and historic minefields and ordnance. There is potential for paleo-landscapes to be present, as palaeogeographic features of archaeological potential were identified during the assessment of geophysical survey data for Eastern Green Link 2 (National Grid and SSE, 2022), located to the south of the Marine Scheme. No known aviation wrecks have been identified thus far within the marine archaeology Study Area, however a number of maritime wrecks have been recorded within the Study Area, and therefore will need to be considered.

The marine historic environment encompasses not only shipwrecks, but also other evidence of human exploitation of maritime resources, such as shipyards, piers, fish traps, anchor sites and submerged landscapes where human beings and early hominids previously lived or hunted on terrain which was at that time dry land, or where they exploited fish and shellfish on the coast which is now submerged (Marine (Scotland) Act 2010, Section 73, paragraph 5). Obstructions and foul ground areas can also represent wrecks that have not been classified due to lack of investigation.

Marine cultural and archaeological remains are located on and below the seabed and can include wrecks and wreckage of historical, archaeological, or artistic importance designated under the Protection of Wrecks Act (1973), wrecks, areas and deposits of national importance designated as an HMPA under the Marine (Scotland) Act (2010) and military (including human) remains designated under the Protection of Military Remains Act (1986). It is an offence to cause damage to protected historic remains and in some cases where a restricted zone exists around the remains, a licence is required before any works or salvage can be undertaken within this zone.

No marine cultural heritage statutory designations are present within the marine archaeology Study Area.

14.5.1 Wrecks

Shipwreck inventories and documentary sources are usually biased towards the 18th century and later when more systematic reporting began. Therefore, there are few known historical records of wrecks from medieval or earlier periods. As a maritime nation with a reliance on marine based trade and exchange, and with the exploitation of marine resources from prehistoric times, there have been countless shipwrecks around UK waters from all periods – many of which remain unreported.

The coastal archaeological evidence suggests exploitation of the marine environment in the North Sea for fishing and transport purposes from prehistoric times. There are many trading and fishing ports up the east coast, and shipping along this coast and across the North Sea is well documented from the medieval period onwards (Wessex Archaeology, 2012). There is a density of known wrecks off the coast north of Peterhead, between Rattray Head and Kinnaird Head, probably reflecting the hazards of this coastline and that shipping closed in to round the northeast coast of Scotland.

Therefore, there is potential for unknown, unrecorded vessels to have sunk in the general area over the centuries, although the likelihood of encountering wrecks dating before the 18th century is low (Wessex Archaeology, 2009). This may be due to the material used in shipping construction at this time. It is also important to note that wrecking events are biased closer to shore, where navigational hazards are present.

Table 14-2 notes there are seven wrecks located within the Marine Scheme area, and 11 wrecks located within the marine archaeology Study Area (UKHO, 2023).

Table 14-2 Wrecks located within the marine archaeology Study Area (UKHO, 2023)

Name	Wreck ID	Latitude	Longitude	Distance from the Marine Scheme (km)
-	2488	57 25.443 N	0 28.058 E	0
-	2507	57 6.593 N	1 45.627 E	0
-	74769	57 25.765 N	1 36.236 W	0
HMS FLOTTA (POSSIBLY)	2268	57 27.629 N	1 39.189 W	0
MERCATOR	2258	57 24.287 N	1 34.603 W	0
ST GLEN	2260	57 24.987 N	1 38.103 W	0
-	2262	57 25.5 N	1 45.449 W	0
GANNET D	2517	57 18.793 N	1 5.4 E	0.13
BEN TARBET	2273	57 29.753 N	1 46.335 W	0.19
-	90381	57 9.1 N	1 38.59 E	0.20
U 74	2493	57 9.96 N	1 19.9 E	0.20
-	88704	56 50.657 N	2 10.019 E	0.30
-	95565	57 1.7 N	1 49.031 E	0.31
IJSSELSTROOM	73699	57 29.85 N	1 45.91 W	0.32
-	59197	57 27.686 N	1 38.603 W	0.34
-	2263	57 26.187 N	1 35.104 W	0.43
-	2252	57 23.298 N	1 26.563 W	0.50
-	57100	57 9.827 N	1 26.1 E	0.55

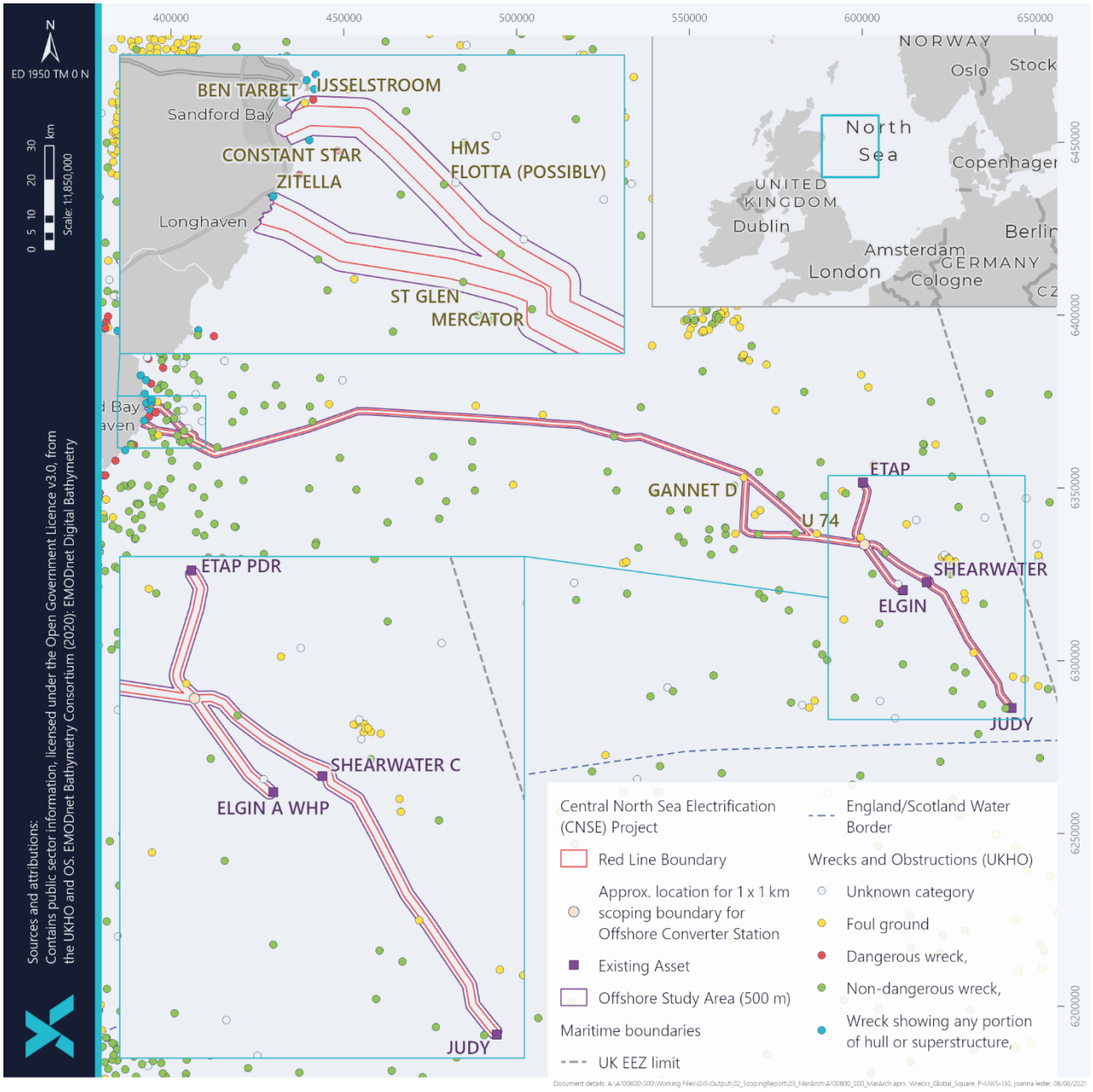

Figure 14-2 Wrecks within the vicinity of the Marine Scheme (UKHO, 2023)

14.5.2 Aircraft

Marine aviation archaeology receptors comprise the remains or associated remains of military and civilian aircraft that have been lost at sea.

There are no aircraft reported as being lost in the marine archaeology Study Area. A number of aircraft did go missing without trace off eastern Scotland while on military service throughout the 20th century, though mostly during World War II. The likelihood of finding one within the marine archaeology Study Area is limited, however, discovery of any British military aircraft would automatically fall under the Protection of Military Remains Act 1986 (PoMRA).

14.5.3 Submerged Palaeolandscapes, Archaeological Sites and Artefacts

Hominids and humans have occupied the UKCS at various times for more than 700,000 years but finds showing this are incredibly rare. Although in general terms, the potential for submerged prehistoric archaeology and landscapes across wide areas of the UKCS is high (Wessex Archaeology, 2009), the potential for site preservation in areas of the shelf deeper than 80 m is low (Flemming 2003). Submerged landscapes are where human beings and early hominids previously lived or hunted on terrain which was at that time dry land, or where they exploited fish and shellfish on the coast which is now submerged.

There is potential for palaeolandscapes to be present as palaeogeographic features of archaeological potential were identified during the geophysical survey for Eastern Green Link 2 - Marine Scheme (National Grid and SSE, 2022), located to the south of the Marine Scheme. These areas of archaeological potential were close to the coast. Further offshore, the area is likely to have been fully marine and, prior to that, under full glacial conditions (Clark *et al.*, 2018). Current research indicates that there is some potential for submerged post-glacial/Late Pleistocene and Holocene sediments and, prehistoric remains to survive in this part of the North Sea, particularly closer to shore. Such environments may be encountered within the marine archaeology Study Area. However, the chances of encountering in situ archaeological artefacts/sites are lower (Bicket and Tizzard 2015; Dawson *et al.* 2017; Flemming 2004; Sturt 2013; ABPmer, 2010).

14.6 Embedded Mitigation

At this stage topic-specific measures have not been developed; however, certain measures have been proposed as part of the development process in line with industry best-practice to reduce the potential for impacts to marine archaeology receptors (Table 14-3). The embedded mitigation specific to marine archaeology receptors will be agreed upon by the Applicant and will be detailed within the EIAR. Unless otherwise indicated, the mitigation measures will be secured through the ML consent conditions.

Table 14-3 Proposed embedded mitigation measures

Embedded Mitigation	Type (Primary or Tertiary)
An archaeological interpretation of relevant survey data will be conducted to identify any sensitive receptors.	Primary
Micro-routeing within the Marine Scheme will be carried out to help avoid or minimise interactions with localised engineering and environmental constraints (including avoidance of any identified seabed heritage assets and other features of archaeological significance). This decision making will be informed by CBRA.	Primary
In advance of any installation activity, the preparation of a marine heritage Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) to avoid, mitigate and manage any interactions with previously unknown features of archaeological interest.	Tertiary

14.7 Scoping of Impacts

Potential impacts have been identified and considered based on professional experience, the PDE, relevant third-party environmental reports (as summarised in Section 14.4) and the understanding of the marine archaeological baseline. The potential impacts for marine archaeology receptors are summarised in Table 14-4.

Table 14-4 Scoping of potential impacts relating to marine archaeology receptors

Potential Impact	Scoping Result	Justification	Information Required to Inform the Assessment	Assessment Method
Installation and Decommissioning				
Direct loss of or damage to known or unknown marine and intertidal historic environment assets arising from installation activities	Scoped in	Any aspects of the Marine Scheme that involve contact with the seabed and/or the removal of seabed sediments may lead to direct physical impacts to known and unknown assets. Such activities include: • Cable installation, including route clearance, cable laying and burial, and cable protection; • Landfall installation activities, including HDD, HDD duct installation, and cable installation; • Installation of the OCS; and • Seabed contact by jack-up vessel, and / or anchors of other vessels.	Desk based assessment of existing data sources alongside analysis of site-specific survey data including marine geophysical survey data.	Desk based assessment, including interpretation of Marine Scheme specific survey data, considering the PDE.
Indirect loss of or damage to known or unknown marine and intertidal historic environment assets arising from installation activities	Scoped in	The indirect effects upon the known and potential marine archaeological assets are those which occur because of changes to hydrodynamic and sediment transport regimes, where these changes result from activities and structures associated with the installation phase of the Marine Scheme. Changes to hydrodynamic and sediment transport regimes can result in increased scour or deposition over archaeological assets. Relevant activities include: • Lowering of areas of sandwaves (during route preparation), potentially resulting in changes to local hydrodynamics; and • Dispersal of suspended sediment (during trenching and excavations) potentially resulting in increased sediment transport regimes.	Desk based assessment of existing data sources alongside any relevant information from the geophysical technical report which will be reviewed from an archaeological perspective. This will be informed by the physical environment assessment (Section 6).	Desk based assessment considering the PDE.
Loss of or damage to submerged prehistoric landscapes arising from installation activities	Scoped in	Any aspects of the Marine Scheme that interacts with sediments beneath the seabed have the potential to result in the damage/loss of submerged prehistoric landscape deposits or features, if any are present. Such activities include cable trenching, and the installation of the OCS foundations.	Desk based assessment of existing data sources alongside analysis of site-specific survey data including marine geophysical data.	Desk based assessment, including interpretation of Marine Scheme specific survey data, considering the PDE.
Potential impacts on the setting of heritage assets from the presence of vessels during the installation/ decommissioning activities	Scoped out	Marine Scheme installation/decommissioning activities will be temporary and localised. The temporary and localised nature will be unlikely to alter the historic seascape character and hence, the potential impacts to the historic environment assets will not be significant. This potential impact is therefore scoped out.		
Operation and Maintenance				
Direct loss of or damage to known or unknown marine and intertidal historic environment assets arising from operation and maintenance of the Marine Scheme.	Scoped in	Direct operation and maintenance effects will be limited to those arising from the maintenance of the HVAC and HVDC Cables and the OCS. Potential direct impacts on marine archaeology during the operation of the Marine Scheme could include: • Remedial trenching activities; • Submarine cable repairs; • Placement of external cable protection measures; and • Anchors or jack-ups being used for any maintenance activities.	Desk based assessment of existing data sources alongside analysis of site-specific survey data including marine geophysical data.	Desk based assessment, including interpretation of Marine Scheme specific survey data, considering the PDE.
Indirect loss of or damage to known or unknown marine and intertidal historic environment assets arising from operation and maintenance of the Marine Scheme.	Scoped in	The effects upon the known and potential marine archaeological features considered here are those which occur as a result of changes to hydrodynamic and sediment transport, where these changes have occurred as a result of the presence of new seabed structures associated with the Marine Scheme. These include: • Changes to hydrodynamic and sediment transport, where these changes have occurred as a result of the presence of cable protection associated with the Marine Scheme; and	Desk based assessment of existing data sources alongside any relevant information from the geophysical technical report which will be reviewed from an archaeological perspective. This will be informed by the physical environment assessment (Section 6).	Desk based assessment considering the Marine Scheme PDE.

Potential Impact	Scoping Result	Justification	Information Required to Inform the Assessment	Assessment Method
		• Changes to hydrodynamic and sediment transport, where these changes have occurred as a result of the presence of the OCS foundations.		
Long-term changes to the setting of historic environment assets arising from OCS and cable installation.	Scoped out	The location of the HDD ducts will be beyond the intertidal zone. Cables will be protected via burial (where feasible) or rock protection and therefore will not be visible. The OCS is located over 200 km offshore and is set in the context of existing oil and gas installations. The presence of vessels associated with maintenance activities will be localised, temporary and unlikely to deviate from baseline vessel activity in the area. As such, any potential impacts to the setting of the historic environment assets not expected to be significant. This potential impact is therefore scoped out.		

14.8 Potential Cumulative and Transboundary Impacts

Although the predicted impacts of the Marine Scheme are anticipated to be localised, there is the possibility that certain impacts from the Marine Scheme may interact with other projects, plans and activities, which could result in a cumulative effect on marine archaeology receptors. There is the potential for cumulative marine archaeology impacts to occur during the installation phase of the Marine Scheme. The projects to be considered as part of the Cumulative Impact Assessment are summarised in Table 4-3. The assessment will be made based on information in the public domain, and in line with the methodology outlined in Section 4.

There is no potential for transboundary impacts upon marine archaeology receptors due to installation, operation, maintenance and decommissioning of the Marine Scheme. The potential impacts are contained within the area that will be directly impacted by the Marine Scheme and therefore transboundary impacts do not need to be considered further.

14.9 Proposed EIA Methodology

The marine archaeology EIA will be undertaken by suitably qualified and experienced marine archaeologists, in line with the overall EIA methodology described in Section 4 and will be in accordance with the relevant legislation, policy, and standard industry and best-practice guidance. The methodologies used in the investigation will be in accordance with standards and guidelines produced by the Scottish Government, Historic Environment Scotland and the Licensing and Planning Authorities and the Chartered Institute for Archaeologists. Specific detailed methodology for the marine archaeology will be agreed in consultation with statutory stakeholders, including:

- MD-LOT;
- HES; and
- Aberdeenshire Council Archaeology Service.

In addition, any upcoming guidance being developed will be utilised where appropriate.

The marine archaeology section will be conducted based on analysis of desk-based sources, and augmented by an archaeological interpretation of available marine geophysical and geotechnical survey data obtained during the pre-installation surveys.

14.10 Scoping Questions

The Applicant would request responses to the Greenfield scoping questions of relevance to Section 14. Marine Archaeology. Please respond to Questions 7-14 in Table 1-2.

14.11 Marine Archaeology: Brownfield

The 500 m safety zones are areas that have been exposed to oil production and drilling operations over a number of years, particularly before the prohibition of oil based muds discharges. There are no known marine archaeological artefacts within the zones. There is one possible obstruction located approximately 0.8 Nm (1.6 km) to the west of

the Judy Asset. This possible obstruction is an unclassified wreck first identified in 1992, the current status of the obstruction is unknown (Canmore, 2023).

Given the heavily modified condition of the 500 m safety zones, and an absence of known marine archaeological artefacts, the activity associated with the Brownfield Scope will not have any additional impact on marine archaeology receptors. It is therefore proposed that marine archaeology receptors can be scoped out of further assessment associated with the Brownfield Scope.

Embedded mitigation relevant to marine archaeology (Section 14.6) will be applied to the activities associated with the Brownfield Scope.

14.11.1 Brownfield Scoping Questions

The Applicant would request responses to the Brownfield scoping questions of relevance to Section 14. Marine Archaeology. Please respond to Question 5 in Table 1-3.

14.12 References

Aberdeenshire Council Archaeology Service (2023). Historic Environment Record. https://online.aberdeenshire.gov.uk/smrpub/.

ABPmer (2010). Waterlands - Developing Management Indicators for submerged Palaeoenvironmental Landscapes

Bicket, A. & Tizzard, L. (2015). 'A review of the submerged prehistory and palaeolandscapes of the British Isles.' Proceedings of the Geologists' Association 126.6, 643-663.

Canmore. (2023). Obstruction (possible) wreck classification. Available online at: https://canmore.org.uk/site/322431/unknown

Clark, C. D., Ely, J. C., Greenwood, S. L., Hughes, A. L. C., Meehan, R., Barr, I. D., Bateman, M. D., Bradwell, T.,Doole, J., Evans, D. J. A., Jordan, C. J., Monteys, X., Pellicer, X. M. & Sheehy, M. 2018 (January): BRITICEGlacialMap,version2:amapandGISdatabaseofglaciallandformsofthelastBritish–IrishIceSheet.Boreas,Vol.47,pp. 11–27. https://doi.org/10.1111/bor.12273. ISSN 0300-9483

Dawson, S., Bates, R., Wickham-Jones, C. & Dawson, A. (2017). 'Northern North Sea and Atlantic Northwest Approaches.' In Flemming, N.C., Harff, J., Moura, D., Burgess, A. & Bailey, G.N. (eds.) Submerged Landscapes of the European Continental Shelf: Quaternary Paleoenvironments. Chichester: John Wiley & Sons Ltd. 187-209.

Flemming, N. C. (2003). The scope of Strategic Environmental Assessment of North Sea areas SEA3 and SEA2 in regard to prehistoric archaeological remains Prepared for the Dept. of Trade & Industry. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/197339/TR_SEA3_Archaeology.pdf

Flemming, N.C. (2004). Submarine prehistoric archaeology of the North Sea: research priorities and collaboration with industry.

Gaffney, V., and Fitch, S. (2022). Europe's Lost Frontiers: Volume 1. Available online at: https://www.archaeopress.com/Archaeopress/download/9781803272689

Historic Environment Scotland (HES) (2023). Canmore. https://canmore.org.uk/

HES (2023). The Historic Environment Scotland Data Portal. https://portal.historicenvironment.scot/

Larn, R., & Larn, B. (1998). The Ship Wreck Index of Great Britain & Ireland Vol.4 Scotland. London: Lloyd's Register of Shipping.

National Grid and SSE (2022). Eastern Green Link 2 – Marine Scheme. Environmental Appraisal Report, Volume 2. Chapter 12 – Marine Archaeology. https://marine.gov.scot/sites/default/files/c12_environmental_appraisal_report_-_marine_archaeology.pdf.

Sturt, F., Garrow, D. & Bradley, S. (2013). 'New Models of North West European Holocene palaeogeography and inundation'. Journal of Archaeological Science 40, 3963-3976.

UKHO (2023). UKHO wreck register & nautical charts. https://www.admiralty.co.uk/digital-services/data-solutions/admiralty-marine-data-portal.

Wessex Archaeology. (2009). UKCS Offshore Oil and Gas and Wind Energy Strategic Environmental Assessment: Archaeological Baseline. Prepared by WA Coastal & Marine for the Department of Energy and Climate Change. Wessex Report 68860.03. Salisbury: Wessex Archaeology and DECC.

Whittaker, I.G. (1998). Off Scotland: a comprehensive record of maritime and aviation losses in Scottish waters. Edinburgh: C-Anne Publishing.

15 OTHER SEA USERS

15.1 Introduction

This section of the Scoping Report identifies other users of the marine environment (i.e. 'other sea users') of relevance to the Marine Scheme and considers the potential impacts from the installation, operation and maintenance and decommissioning of the Marine Scheme. The other sea users considered within this section include:

- Oil and gas activities;
- Offshore renewable energy projects;
- Subsea cables;
- Licenced dredge disposal sites;
- Military and defence activities;
- Aquaculture;
- Recreation and tourism; and
- Other third-party infrastructure.

This section of the Scoping Report should be read in conjunction with the following sections:

- Section 12 Commercial Fisheries; and
- Section 13 Shipping and Navigation.

15.2 Legislation, Policy and Guidance

In addition to the relevant policy and legislation described in Section 2, the following section outlines the legislation, policy and guidance that will be taken into consideration in relation to the other users of the marine environment EIA.

No specific legislative controls exist in Scotland which can be applied to the assessment of the other users of the marine environment.

15.2.1 Guidance

- Energy Installations and Submarine Cable Infrastructure in National Waters (ICPC, 2013);
- The European Subsea Cable Association (ESCA) guideline No.6. 'The Proximity of Offshore Renewable Energy Installations & Submarine Cable Infrastructure in UK Waters' (ESCA, 2016); and
- Guidance on assessing the socio-economic impacts of offshore wind farms (OWFs), produced by Oxford Brooks and Vattenfall (Glasson *et al.*, 2020);
- The RYA Position on Offshore Renewable Energy Developments: Paper 1 (of 4) – Wind Energy, June 2019 (RYA, 2019);
- Assessment of Impact of Offshore Wind Energy Structures on the Marine Environment (Marine Institute, 2000);
- International Cable Protection Committee (ICPC) recommendations (ICPC, 2019);
- Oil and Gas UK, Pipeline Crossing Agreement and Proximity Agreement Pack (Oil and Gas UK, 2015); and
- The Crown Estate Guidance: Submarine cables and offshore renewable energy installation – Proximity study (TCE, 2012b).

15.3 Study Area

The other sea users Study Area is defined by a 10 NM (18.5 km) buffer around the Marine Scheme from MHWS to the Assets. The other sea users Study Area is considered large enough to encompass activities (e.g. movements of mobile other sea users) which have the potential to be impacted, while remaining specific to the Marine Scheme. The other sea users Study Area is consistent with the Study Area for shipping and navigation.

15.4 Key Data Sources

The existing data sets and literature with relevant coverage to the Marine Scheme, which have been used to inform this Scoping Report and are proposed to inform the baseline characterisation for the EIA are outlined in Figure 15-1.

Table 15-1 Data sources for the other sea users assessment

Name of Source	Description/Link	Author	Date
The Marine Scotland National Marine Plan Interactive (NMPi) Maps	Marine Scotland - National Marine Plan Interactive (atkinsgeospatial.com)	Marine Scotland	2023
Sectoral Marine Plan: Regional Locational Guidance	https://www.gov.scot/publications/sectoral-marine-plan-regional-locational-guidance/	Marine Scotland	2020
Scotland's Marine Atlas: Information for the National Marine Plan	https://marine.gov.scot/sma/content/scotlands-marine-atlas-information-national-marine-plan#:~:text=Scotland%27s%20Marine%20Atlas%3A%20Information%20for%20The%20National%20Marine,The%20Scottish%20Government%20%205%20more%20rows%20	Baxter *et al.*	2011
Scotland's National Marine Plan	https://www.gov.scot/publications/scotlands-national-marine-plan/	Marine Scotland	2015
UK Offshore Energy SEA 4 – Appendix 1h – Other Users and Material Assets	https://www.gov.uk/government/consultations/uk-offshore-energy-strategic-environmental-assessment-4-oesea4	BEIS	2022
Marine Themes	https://www.marinefind.co.uk/?r=site/data	MarineFIND	2019
UK Coastal Atlas of Recreational Boating	uk-coastal-atlas-of-recreational-boating (rya.org.uk)	Royal Yachting Association	2019
Scottish Marine Recreation and Tourism Survey	Scottish Marine Recreation & Tourism Survey 2015 | Marine Scotland Information	Marine Scotland	2015
Crown Estate Scotland (CES) spatial data, including: • Aquaculture; • Energy and infrastructure (e.g. offshore wind, tidal, wave, CCS, cables and pipelines)	https://www.crownestatescotland.com/resources/documents	Crown Estate Scotland	2023
North Sea Transition Authority (NSTA) spatial data, including: • Wells; • Surface oil and gas infrastructure; • Subsurface oil and gas infrastructure; and • Pipelines.	https://www.nstauthority.co.uk/data-centre/interactive-maps-and-tools/	NSTA	2023
KIS-ORCA	https://kis-orca.org/subsea-cables/	KIS-ORCA	2023

Name of Source	Description/Link	Author	Date
Marine Themes for information on non UKCS infrastructure	https://www.oceanwise.eu/data/marine-themes/	OceanWise Ltd	2023

15.5 Baseline Environment

15.5.1 Oil and gas activity and carbon capture and storage

The other sea users Study Area is located in CNS, a well-developed area for oil and gas infrastructure (BEIS, 2022). This infrastructure includes pipelines, wells, and surface and subsurface structures. Given the extensive infrastructure within the CNS, and the steady decline of hydrocarbon resources in UK waters, decommissioning of existing assets is on the rise and expected to increase (BEIS, 2022), it is therefore possible that the decommissioning of these structures could overlap with the operations of the Marine Scheme.

The main driver for the CNSE Project is the decarbonisation of oil and gas operations in the North Sea through electrification; therefore it is intentionally located near to the Assets which are part of the project (Figure 15-1) with the primary aim to connect to them.

Figure 15-2 shows much of the other sea users Study Area runs through licensed blocks or blocks currently on offer through the 33rd License Round. There are also many surface (e.g. platforms) and subsurface (e.g. wells) facilities in the vicinity of the Marine Scheme (Figure 15-1), and there are several oil and gas pipelines within the other sea users Study Area, some of which will cross the HVAC and HVDC Cables. On the approach to the landfall options, the HVDC Cable will cross the Forties to Cruden Bay pipelines, the Cruden Bay fibre optic cable and the Jersey oil and gas proposed power cable. There is a further crossing offshore with the Judy – Culzean telecommunication cable. Proximity / crossing agreements will be sought between the Applicant and relevant asset owners. Further information relating to the volume, location and type of crossings required along the cable routes will be presented in the EIAR.

Any pipeline crossings would be managed by standard crossing agreements with the pipeline operators.

There are no Carbon Capture and Storage (CCS) projects located within the Study Area. The Acorn Project, a CCS project supporting the decarbonisation of two St Fergus gas terminals, is located to the north of the Study Area. Furthermore, the Peterhead combined cycle gas turbine generating system and carbon capture plant is proposed to be located between Boddam and Sandford Bay (SSE Thermal, 2022). However, this project will not consist of any construction works in the marine environment.

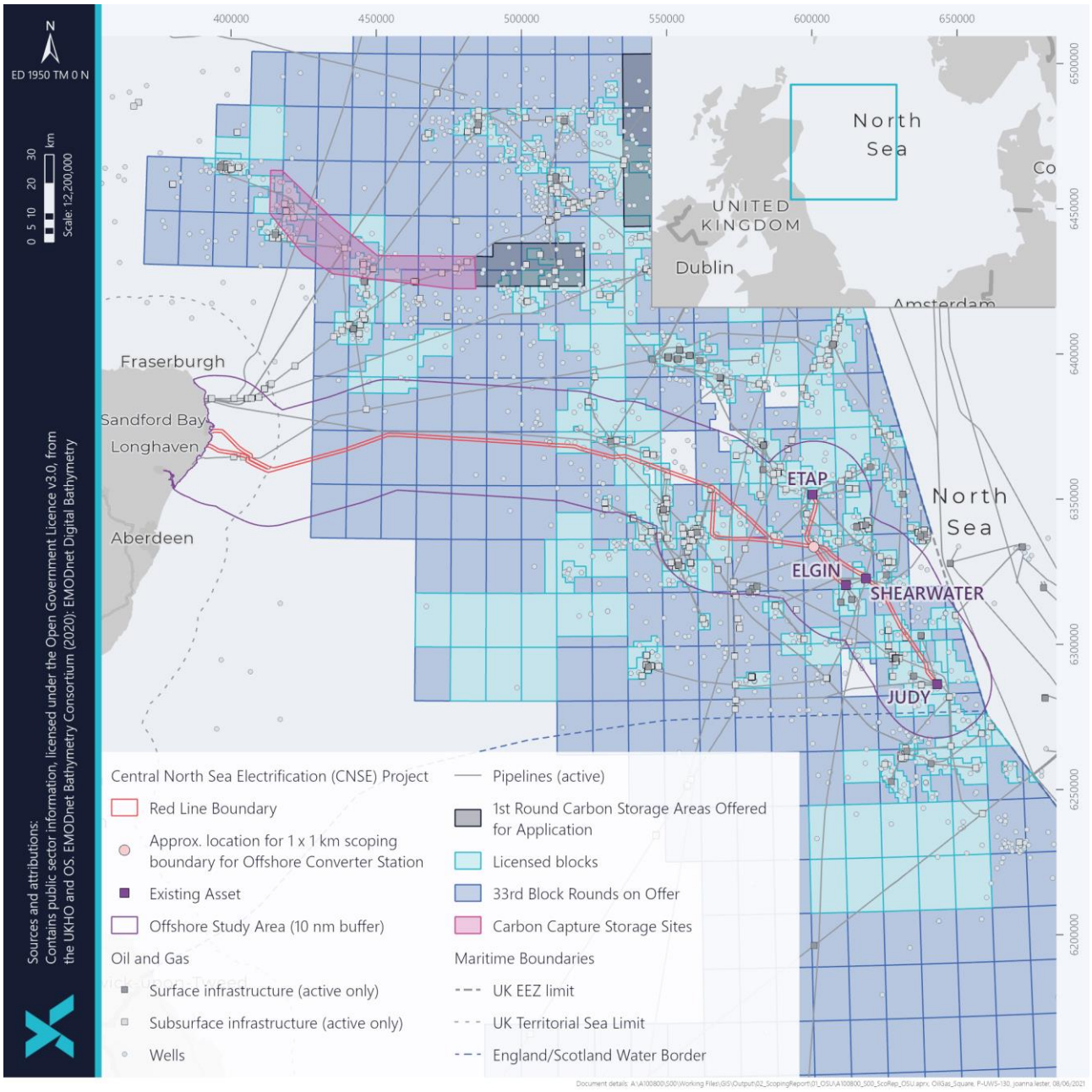

Figure 15-1 Oil and gas infrastructure in the vicinity of the other sea users Study Area

15.5.2 Offshore renewable energy developments

UK waters, in particular the North Sea, are a current focus for significant offshore wind development activity. There are a number of offshore wind projects which are both operational and in early stage development which are situated off the Aberdeenshire coast.

Figure 15-2 shows the proximity of relevant developments to the other sea users Study Area for this project.

The nearest operational offshore wind farm to the Marine Scheme is the Hywind Scotland Pilot Park. Hywind is a 30 Megawatt (MW) floating offshore wind farm which was developed by Equinor in 2017 (Equinor, 2023). The Hywind array is located 7.9 km north of the CNSE Cable Corridor. The array is approximately 25 km off Peterhead.

The Aberdeen Bay Windfarm is also located in the other sea users Study Area, located approximately 3 km off the east coast of Aberdeen, Scotland. Aberdeen Bay Windfarm is a 97 MW fixed offshore wind farm which was developed by Vattenfall in 2018 (Vattenfall, 2023). Aberdeen Bay is located 22 km south of the Marine Scheme, outwith the other sea users Study Area.

Scotland is a global leader in offshore renewable energy developments, with leasing rounds conducted by CES, identifying regions suitable for wind, wave and tidal energy developments. Leasing rounds for renewable energy developments from 2009, 2012 and most recently in January 2022 (ScotWind) and March 2023 INTOG has seen the east coast of Scotland support a number of potential offshore wind energy developments.

The results of the INTOG Leasing Round, to support the development of innovative small-scale offshore wind developments as well as those that will electrify and power oil and gas facilities, were recently published on 24th March 2023, with 13 projects being awarded initial agreements, known as 'exclusivity agreements'. The Marine Scheme is located within INTOG areas E-a and E-b, where offshore wind developments targeting oil and gas decarbonisation under the INTOG Leasing Round were considered. The proposed Green Volt Offshore Wind Farm was awarded an exclusivity agreement under the INTOG Leasing Round in INTOG area E-B, and the consent application for this development was submitted to MD-LOT in February 2023. The export cable route for the proposed Green Volt Offshore Wind Farm has a number of possible landfall locations, some of which are south of the Marine Scheme; consequently, there is a possibility that the Green Volt export cable route could cross the HVDC Cables. A further five INTOG projects are located within the Study Area, as shown on Figure 15-2 including Cenos offshore wind farm and Salamander offshore wind farm, both at Scoping stage (distances to these INTOG projects are captured in Section 4.2.3).

The Marine Scheme runs along the northern boundary of the Muir Mhòr and Campion offshore windfarm sites, which are Option Agreement Areas awarded under the ScotWind Leasing Round.

There are no current leasing agreements for wave and tidal energy developments within the vicinity of the other sea users Study Area or along the east coast of Scotland (Crown Estate Scotland, 2020).

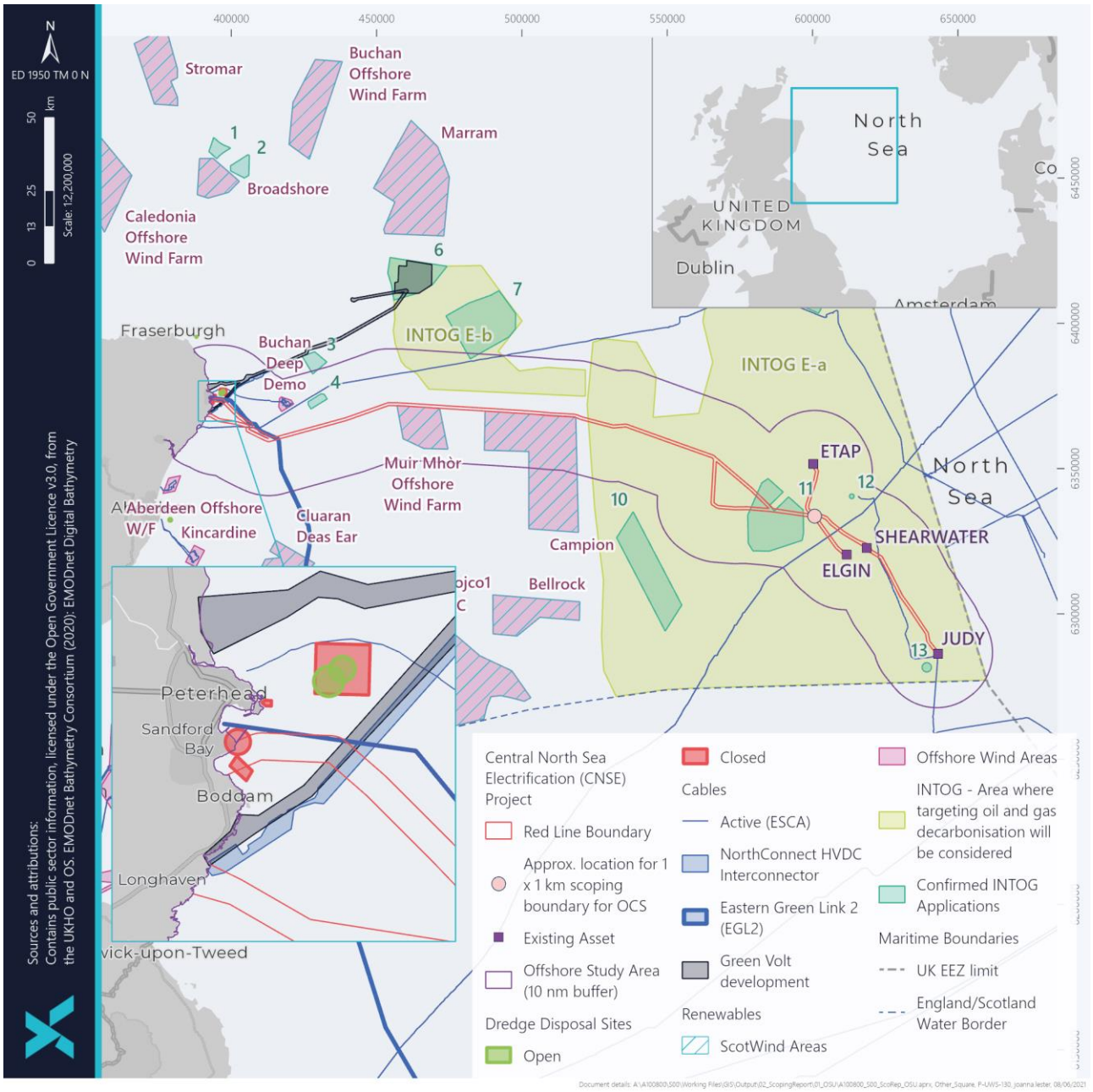

Figure 15-2 Other users of the marine environment

15.5.3 Subsea cables

There are numerous planned and existing submarine cables within the North Sea. These cables are used for telecommunications and the transfer of power from onshore to offshore assets, and between Scotland and neighbouring countries (BEIS, 2022). Those relevant to the Marine Scheme are shown in Figure 15-2.

There are three active cables within the other sea users Study Area. These are the TAMPNET CNSFTC Telecommunications cable, the North Sea Link cable, and the Hywind export cable. The Hywind export cable lies

approximately 2.3 km to the north of the Marine Scheme. Both the other cables intersect the potential cable routes for the Marine Scheme.

In addition to the existing active cables, the proposed NorthConnect HVDC Interconnector and the proposed Eastern Green Link 2 cables also lie within the other sea users Study Area. The proposed route for the NorthConnect HVDC Cable crosses the Marine Scheme in the vicinity of the Longhaven landfall option, running directly in line with, to the south of, the proposed Green Volt cable. The proposed Eastern Green Link 2 cable route also crosses the Marine Scheme approximately 30 km from shore.

Awards made under the 33rd Offshore Oil and Gas Licensing Round and the 2022 ScotWind leasing round have the potential to result in the application and development of additional cables routes and pipelines within the other sea users Study Area that may have the potential to interact with the development.

15.5.4 Licenced dredge disposal sites

There are two open marine dredge disposal sites in the coastal waters off Peterhead – the North Buchan Ness and Peterhead dredge disposal sites that are located within the other sea users Study Area (Scottish Government, 2015) (located approximately 2.0 km and 1.4 km from the Marine Scheme, respectively). These are identified in Figure 15-2.

15.5.5 Military and defence activities

There are no military exercise areas and danger areas (PEXAs) that intersect with the Marine Scheme or the other sea users Study Area.

There are no current or historic munitions disposal sites within the vicinity of the Marine Scheme. It is therefore considered that interaction between the Marine Scheme and unexploded ordnance is low (see Section 14).

15.5.6 Marine recreation and tourism

In 2015, Marine Scotland published the Scottish Marine Recreation and Tourism Survey (SMRTS) (Marine Scotland 2015b) indicating the areas of importance for the Scottish coastline. The SMRTS identified the different types of recreation and tourism in addition to the intensity. This included activities from recreational vessels and routes to and from the major marinas and ports.

The SMRTS highlights that the other sea users Study Area displays low to medium activity for all recreational and tourism activities combined. Marine recreational activities typically fall within 10 km of the coastline. Therefore, the majority of the Marine Scheme will have very little or no interaction with marine recreation and tourism. The types of recreational and tourist activities which have been recorded within the coastal area of the other sea users Study Area include:

- General and marine recreation and tourism;
- Birds and wildlife watching;
- Coastal climbing;

- Land yachting, power kiting, and kite buggying at the coast;
- Scuba diving;
- Surfing, kayaking, and paddleboarding;
- Wind and kite surfing;
- Yachting;
- Sailing;
- Cruising; and
- Sea angling.

There are known surfing beaches within the other sea users Study Area, including Peterhead (Sandford Bay), and Cruden Bay (Magic Seaweed, 2023). Seabird watching is also of particular interest with the Longhaven Cliffs being highlighted as a tourist attraction with marine bird features, Atlantic puffins and harbour seals highlighted as two important features to look for (Scottish Wildlife Trust, 2023). Additionally, the Moray Firth hosts populations of cetaceans which can travel along the Scottish coastline and also contribute to wildlife watching. Peterhead has a large fishing community with the largest fishing port in Europe. This is also used by recreational anglers with angling clubs and tourist angling options present in the area. Recreational vessels have a medium activity within the other sea users Study Area, and Peterhead Bay contains four RYA Training Centres, a Sailing Club and a marine, as outlined in Section 13. It should also be noted that two ferry routes cross over the cable corridor – Aberdeen to Mainland Orkney, and Aberdeen to Shetland (also see Section 13 Shipping and Navigation). Whilst there are recreational and tourism activities present, it is also worth noting that these are influenced by season, weather and tidal conditions.

15.5.7 Aquaculture

Scotland is a global leader in aquaculture; however, these activities occur primarily on the west coast, with very few aquaculture sites along the east coast of Scotland (BEIS, 2022). There are no aquaculture sites in the vicinity of the other sea users Study Area.

Information on commercial fisheries activities in relation to the Marine Scheme can be found in Section 12.

15.6 Embedded Mitigation

At this stage topic-specific measures have not been developed; however, certain measures have been proposed as part of the development process in line with industry best-practice to reduce the potential for impacts to other sea users (Table 15-2). The embedded mitigation specific to other sea users receptors will be agreed upon by the Applicant and will be detailed within the EIAR. Unless otherwise indicated, the mitigation measures will be secured through the ML consent conditions.

Table 15-2 Proposed embedded mitigation measures

Embedded Mitigation	Type (Primary or Tertiary)
Develop and implement a CEMP, including a Marine Pollution Contingency and Control Plan, INNS management plan, Emergency Response Cooperation Plan (ERCoP.	Tertiary
Micro-routeing within the Marine Scheme will be carried out to help avoid or minimise interactions with localised engineering and environmental constraints (including avoidance of any identified seabed heritage assets and other features of archaeological significance). This decision making will be informed by CBRA..	Primary
Placement of scour protection for the OCS will be minimised as far as possible (supported by a scour assessment).	Primary
Notification to the UKHO of the proposed works to facilitate the promulgation of maritime safety information and updating of nautical charts and publications.	Primary
Promulgation of information for vessel routes, timings and locations or activities, safety zones and advisory passing distances as required via Notices to Mariners, Kingfisher Bulletins, radio navigation warnings, NAVTEX and/or broadcast warnings.	Primary
Consultation with all other sea users likely to be impacted by activities associated with the Marine Scheme throughout the installation, operation and maintenance and decommissioning phases.	Primary
Compliance with MARPOL regulations and best-practise protocols to prevent and manage incidents of accidental release of marine contaminants.	Tertiary
Monitor cable protection (i.e., trenching or external protection where burial is not possible). Where exposed cable sections or other threats to sea users are identified, this will be reported to the MCA, NLB, Kingfisher and UKHO no later than 24 hours after discovery.	Primary

15.7 Scoping of Impacts

Potential impacts have been identified and considered based on professional experience, the PDE, and the understanding of the local baseline for other sea users.

The potential impacts for the identified receptors are summarised in Table 15-3 below. The scope of potential cumulative and transboundary impacts on other sea users receptors are discussed in Section 15.8.

Table 15-3 Scoping of potential impacts relating to other sea users

Potential Impact	Scoping Result	Justification	Information Required to Inform the Assessment	Assessment Method
Installation and Decommissioning				
Temporary obstruction to other offshore renewable energy projects (wind, wave or tidal)	Scoped in	The Marine Scheme has the potential to interact with other offshore renewable energy infrastructure within the marine environment through the presence of vessels and safety zones during installation and decommissioning. The HVDC Cable lies north of the Muir Mhòr and Campion offshore wind sites and may cross the offshore export cable for the proposed Green Volt Offshore Wind Development. Engagement will be carried out with third-party asset owners and proponents of future infrastructure. Crossing and / or proximity agreements will be developed and agreed as required.	A desk-based analysis will be undertaken, supported by ongoing stakeholder engagement and consultation.	A qualitative assessment will be undertaken based on the Marine Scheme PDE. This assessment will also be supported by the NRA. Further details will be presented within the EIAR.
Temporary obstruction to marine recreational activities	Scoped in	The Marine Scheme has the potential to directly interact with marine recreational activities during installation and decommissioning through the presence of vessels and safety zones, particularly with recreational boating activities and recreational fishing activities within Scottish Territorial Waters.	A desk-based analysis will be undertaken, supported by ongoing stakeholder engagement and consultation.	A qualitative assessment will be undertaken based on the Marine Scheme PDE. Further details will be presented within the EIAR.
Temporary disturbance to coastal tourism during installation	Scoped out	While the installation and decommissioning activities may cause displacement to coastal tourism activities (e.g. recreational fishing), the spatial and temporal extent of this disturbance is highly limited, temporary and reversible; therefore, this potential impact is scoped out.		
Risk of damage to / interference with other third-party assets	Scoped out	The HVAC and HVDC Cables will cross existing pipelines and cables, and the proposed routes for planned cables. Further developments for cables and pipelines are likely in the area. Pre-installation geophysical and environmental surveys will ensure that an accurate understanding of subsea third-party infrastructure is obtained. Should rock placement be required during installation activities, measures will be in place to minimise the area of impact and spread, thereby reducing the potential for damage to other subsea assets. In addition, numerous mitigation measures will be in place to ensure the risk of damage to third-party assets is reduced as far as possible. Dropped objects will be subject to industry standard procedures. Additionally, NtMs measures will be in place. In addition, crossing and / or proximity agreements will be in place where the cables will be adjacent to or required to cross third-party infrastructure. This potential impact is therefore scoped out.		
Temporary obstruction to subsea cables (telecommunication and power cables), dredge and disposal sites, and oil and gas activities	Scoped in	The installation of infrastructure and implementation of safety distances around installation vessels may obstruct activities associated with these other sea users receptors.	Desktop data sources and ongoing consultation with relevant stakeholders.	A qualitative assessment will be undertaken and presented within the EIA based on the Marine Scheme PDE.
Operation and Maintenance				
Obstruction to other sea users arising from the presence of the Marine Scheme	Scoped out	Once installation has concluded the only surface infrastructure associated with the Marine Scheme would be the OCS. Any impact will be highly localised and mitigated through embedded mitigations measures for example safety zones. Please note, impacts to commercial fisheries are considered in Section 12 and will ultimately be assessed in the EIAR. Overall, the presence of infrastructure and the implementation of advisory safe passing distances around project maintenance vessels has limited potential to obstruct activities of nearby third-party developments. This potential impact is therefore scoped out.		
Disturbance to other sea users arising from operation and maintenance activity, including vessel movements	Scoped out	The presence of infrastructure and Marine Scheme vessels relating to operation and maintenance works has the potential to obstruct other sea users. However, the scope and duration of vessel presence will be highly limited. No infrastructure installation is planned as part of the Marine Scheme during the operation and maintenance phase. Additionally, all vessels will be subject to key mitigation (including NtMs as outlined in the preceding sections). Overall, due to the mitigation measures in place and the spatially and temporally limited presence of vessels, this has been scoped out.		

15.8 Potential Cumulative and Transboundary Impacts

Although the predicted impacts of the Marine Scheme are anticipated to be localised, there is the possibility that certain impacts from the Marine Scheme may interact with other projects, plans and activities, which could result in a cumulative effect on other sea users. There is the potential for cumulative other sea users impacts to occur during the installation phase of the Marine Scheme. The projects to be considered as part of the Cumulative Impact Assessment are summarised in Table 4-3. The assessment will be made based on information in the public domain, and in line with the methodology outlined in Section 4.

There is no potential for transboundary impacts on other sea users to arise as a result of installation, operation and maintenance or decommissioning activities associated with the Marine Scheme. Any potential impacts associated with the Marine Scheme will be highly localised. Potential transboundary impacts on other sea users receptors are therefore proposed to be scoped out of the EIA and will not be assessed further within the EIAR.

15.9 Proposed EIA Methodology

The assessment of impacts for other sea users will be conducted in line with the overall EIA methodology described in Section 4 and will be in accordance with the relevant legislation, policy, and standard industry and best-practice guidance.

Consultation will be undertaken with all relevant developers, operators and other sea users within the vicinity of the Marine Scheme to inform the EIA as far as possible. Consultation will help develop a clearer understanding of the nature, timing and duration of any other works that will be ongoing in the waters adjacent to the Marine Scheme during the installation, operation and maintenance and decommissioning phases. Any areas of concern will be identified and considered within the EIA.

The potential direct and indirect impacts of the Marine Scheme on other sea users receptors will be considered both alone and cumulatively with other offshore projects. The sensitivity of each receptor will be considered on a case-by-case basis and the relevant mitigation measures will be made depending on the sensitivity and value of the impacted user or activity. It is likely that any impacts will either be non-significant or able to be fully mitigated after consultation with the relevant stakeholders.

15.10 Scoping Questions

The Applicant would request responses to the Greenfield scoping questions of relevance to Section 15. Other Sea Users. Please respond to Questions 7-14 in Table 1-2.

15.11 Other Sea Users: Brownfield

The Petroleum Act 1987 governs offshore safety zones which are established automatically around all offshore oil and gas installations that project above the sea. Vessels of all nations are required by law to respect safety zones and it is an offence (under section 23 of the Petroleum Act 1987) to enter a safety zone except under special circumstances.

Given that other sea users are already excluded from the 500 m safety zone of each Asset, the activity associated with the Brownfield Scope will not have any additional impact on other sea users receptors. It is therefore proposed that other sea users receptors can be scoped out of further assessment associated with the Brownfield Scope.

Embedded mitigation relevant to other marine users (Section 15.6) will be applied to the activities associated with the Brownfield Scope.

15.11.1 Brownfield Scoping Questions

The Applicant would request responses to the Brownfield scoping questions of relevance to Section 15. Other Sea Users. Please respond to Question 5 in Table 1-3.

15.12 References

Baxter *et al.* 2011. Scotland's Marine Atlas: Information for the National Marine Plan. https://marine.gov.scot/sma/content/scotlands-marine-atlas-information-national-marine-plan#:~:text=Scotland%27s%20Marine%20Atlas%3A%20Information%20for%20The%20National%20Marine,The%20Scottish%20Government%20%205%20more%20rows%20

BEIS 2022. UK Offshore Energy SEA 4 – Appendix 1h – Other Users and Material Assets

Crown Estate Scotland. (2020). Energy and Infrastructure Spatial Data. Available online at: https://www.crownestatescotland.com/resources/documents

DECC. 2011. National Policy Statement for Renewable Energy EN-3

DECC. 2016. UK Offshore Energy SEA 3 https://www.gov.uk/government/consultations/uk-offshore-energy-strategic-environmental-assessment-3-oesea3

Equinor. 2023. Hywind Scotland. https://www.equinor.com/energy/hywind-scotland

KIS-ORCA. 2020. Cables – power and telecoms. https://kis-orca.org/subsea-cables/

Magic Seaweed (2023). UK + IRELAND SURF REPORTS AND SURF FORECASTS. Available at: https://magicseaweed.com

Marine Scotland. 2011. Blue Seas – Green Energy A SMP for Offshore Wind Energy in Scottish Territorial Waters. Part A, The Plan. https://maritime-spatial-planning.ec.europa.eu/practices/blue-seas-green-energy-sectoral-marine-plan-offshore-wind-energy-scottish-territorial

Marine Scotland. 2015(a). Scotland's National Marine Plan. https://www.gov.scot/publications/scotlands-national-marine-plan/

Marine Scotland. 2015b. Scottish Marine Recreation and Tourism Survey. Available at: https://marine.gov.scot/information/scottish-marine-recreation-tourism-survey-2015

Marine Scotland. 2019. Draft Regional Locational Guidance. https://marine.gov.scot/information/regional-locational-guidance

Marine Scotland. 2020. Dredge Spoil Deposit Sites – Open. https://marine.gov.scot/maps/712

MarineFIND. 2019. Marine Themes. https://www.marinefind.co.uk/?r=site/data

RYA. 2019. UK Coastal Atlas of Recreational Boating

Scottish Government. 2015. Dredge Disposal Sites – Open. https://marine.gov.scot/sma/maps/712

Scottish Wildlife Trust. 2023. Longhaven Cliffs. Available at: https://scottishwildlifetrust.org.uk/reserve/longhaven-cliffs

SSE Thermal. 2022. SSE Thermal Peterhead Low Carbon Ccgt Power Station Project EIA Report. Available at: https://www.ssethermal.com/media/a0gjkrmv/main-report.pdf

Vattenfall. 2023. Aberdeen Offshore Wind Farm. Available at: https://group.vattenfall.com/uk/what-we-do/our-projects/european-offshore-wind-deployment-centre

16 SUMMARY OF SCOPING REPORT

16.1 Greenfield Scope

Table 16-1 summarises the scoping of potential impacts for all receptors relevant to the Marine Scheme under the proposed Greenfield Scope (defined per Section 1.1).

Table 16-1 Summary of impacts associated with the Greenfield Scope to be scoped in/out of the EIA

Potential Impact	Installation Phase	O&M Phase	Decommissioning Phase	Cumulative Impacts	Transboundary Impacts
Physical Environment					
Change to seabed levels and sediment properties due to cable installation and decommissioning works	In		In	In	Out
Increases to SSC due to the installation and decommissioning works	In		In	In	Out
Impacts on qualifying features of designated sites due to installation and decommissioning works	In		In	In	Out
Changes to coastal landfall morphology	Out		Out	Out	Out
Introduction of scour		Out		Out	Out
Potential changes to the tidal, wave and sediment transport regime		In		In	Out
Changes to water column structure with impact to stratification		Out		Out	Out
Water and Sediment Quality					
Impacts on water quality status of designated waters	Out		Out	Out	Out

Potential Impact	Installation Phase	O&M Phase	Decommissioning Phase	Cumulative Impacts	Transboundary Impacts
Changes in water and sediment quality due to accidental discharges from vessels during installation and decommissioning	Out		Out	Out	Out
Impacts on water quality status of designated waters		Out		Out	Out
Changes in water and sediment quality due to accidental discharges from vessels during and OCS operation and maintenance		Out		Out	Out
Benthic Ecology					
Temporary benthic habitat / species loss or disturbance	In		In	In	Out
Increased SSC and associated deposition (including mobilisation of potential contaminants)	In		In	In	Out
Increased risk of introduction of INNS	Out		Out	Out	Out
Accidental release of pollutants	Out		Out	Out	Out
Permanent benthic habitat / species loss or disturbance, and permanent change/alteration to substrata and habitats.		In		In	Out
Increased SSC and associated deposition		In		In	Out
Colonisation of hard structures		In		In	Out
Changes in physical processes from cable protection measures		In		In	Out
Impacts to benthic communities as a result of thermal load or EMF arising from the cable during operation		Out		Out	Out
Accidental release of pollutants		Out		Out	Out
Introduction and spread of INNS		Out		Out	Out
Fish and Shellfish					

Potential Impact	Installation Phase	O&M Phase	Decommissioning Phase	Cumulative Impacts	Transboundary Impacts
Temporary habitat and species disturbance or loss	In		In	In	Out
Temporary increases in SSC and associated sediment deposition and potential release of contaminants	In		In	In	Out
Underwater noise: vessels, surveys and cable installation (including seabed preparation activities)	Out		Out	Out	Out
Underwater noise: OCS piling	In		In	Out	Out
Accidental release of pollutants	Out		Out	Out	Out
EMF effects from operational cables		In		In	Out
Long-term habitat loss and disturbance		In		In	Out
Temporary habitat and species disturbance or loss resulting from maintenance operations		Out		Out	Out
Temporary increases in SSC and associated sediment deposition resulting from maintenance operations		Out		Out	Out
Thermal emissions from operational cables		Out		Out	Out
Accidental release of pollutants		Out		Out	Out
Ornithology					
Disturbance and/or displacement from installation and decommissioning activities	In		In	In	Out
Disturbance to prey species and habitats of prey species through increases in SSC / localised deterioration in water quality	In		In	In	Out
Accidental release of pollutants	Out		Out	Out	Out

Potential Impact	Installation Phase	O&M Phase	Decommissioning Phase	Cumulative Impacts	Transboundary Impacts
Long-term habitat change, including the potential for change in foraging opportunities		Out		Out	Out
Disturbance and/or displacement due to the presence of infrastructure and/or maintenance vessels		Out		Out	Out
Accidental release of pollutants		Out		Out	Out
Marine Mammals					
Noise-related impacts (including physiological impacts, barrier effects and displacement) associated with installation noise: vessels, surveys and cable installation (including seabed preparation activities)	Out		Out	Out	Out
Noise-related impacts (including physiological impacts, barrier effects and displacement) associated with installation noise: OCS piling	In		In	In	Out
Disturbance to prey species and habitats of prey species through increases in SSC	In		In	In	Out
Disturbance due to pre-installation surveys	In		In	In	Out
Disturbance due to the physical presence of vessels	Out		Out	Out	Out
Indirect effects of underwater noise on prey species	Out		Out	Out	Out
Risk of injury resulting from collisions with installation vessels	Out		Out	Out	Out
Impacts associated with effects on water quality due to disturbed sediment	Out		Out	Out	Out
Accidental release of pollutants	Out		Out	Out	Out
Long-term habitat change, including the potential for change in foraging opportunities		In		In	Out

Potential Impact	Installation Phase	O&M Phase	Decommissioning Phase	Cumulative Impacts	Transboundary Impacts
Displacement or barrier effects resulting from the physical presence of devices and infrastructure		Out		Out	Out
Risk associated with EMFs associated with subsea cabling		Out		Out	Out
Risk of injury resulting from collision with operation and maintenance vessels		Out		Out	Out
Commercial Fisheries					
Temporary loss, displacement or restricted access to fishing grounds due to presence of vessels and safety zones during route preparation and installation activities.	In		In	In	Out
Interference with fishing activity as a result of increased vessel traffic, including potential increases to steaming times.	In		In	In	Out
Potential for fishing gear to become entangled with cable or OCS (i.e. snagging), resulting in damage or loss of fishing gear.		In		In	Out
Long-term habitat loss and disturbance		In		In	Out
Long-term reduced access to key fishing grounds and resultant displacement		In		In	Out
Shipping and Navigation[24]					
Vessel presence	In	In	In	In	Out
Installation, maintenance and decommissioning activities present disruption to vessels using the area	In	In	In	In	Out
Installation, maintenance and decommissioning activities introducing new subsurface hazards	In	In	In	In	Out

[24] *Please note, the impacts scoped for shipping and navigation have been determined by a different method (see Section 13.7)*

Potential Impact	Installation Phase	O&M Phase	Decommissioning Phase	Cumulative Impacts	Transboundary Impacts
Presence of cable		In		In	Out
Presence of cable		In		In	Out
Presence of cable and associated external protection measures		In		In	Out
Presence of energised cables producing electromagnetic field		In		In	Out
Presence of OCS		In		In	Out
Marine Archaeology					
Direct loss of or damage to known or unknown marine and intertidal historic environment assets arising from installation activities	In		In	In	Out
Indirect loss of or damage to known or unknown marine and intertidal historic environment assets arising from installation activities	In		In	In	Out
Loss of or damage to submerged prehistoric landscapes arising from installation activities	In		In	In	Out
Potential impacts on the setting of heritage assets from the presence of vessels during the installation/ decommissioning activities	Out		Out	Out	Out
Direct loss of or damage to known or unknown marine and intertidal historic environment assets arising from operation and maintenance of the Marine Scheme.		In		In	Out
Indirect loss of or damage to known or unknown marine and intertidal historic environment assets arising from operation and maintenance of the Marine Scheme.		In		In	Out
Long-term changes to the setting of historic environment assets arising from OCS and cable installation.		Out		Out	Out

Potential Impact	Installation Phase	O&M Phase	Decommissioning Phase	Cumulative Impacts	Transboundary Impacts
Other Sea Users					
Temporary obstruction to other offshore renewable energy projects (wind, wave or tidal)	In		In	In	Out
Temporary obstruction to marine recreational activities	In		In	In	Out
Temporary disturbance to coastal tourism during installation	Out		Out	Out	Out
Risk of damage to / interference with other third-party assets	Out		Out	Out	Out
Temporary obstruction to subsea cables (telecommunication and power cables), dredge and disposal sites, and oil and gas activities	In		In	In	Out
Obstruction to other sea users arising from the presence of the Marine Scheme		Out		Out	Out
Disturbance to other sea users arising from operation and maintenance activity, including vessel movements		Out		Out	Out

16.2 Brownfield Scope

For the proposed Brownfield Scope (defined per Section 1.1), it is proposed that further assessment includes benthic ecology and impact piling which may be used during installation of the two BLPs (per Table 16-2). All other receptors and potential impacts are scoped out of further assessment for the Brownfield Scope.

Table 16-2 Summary of potential impacts associated with the Brownfield Scope to be scoped in for further assessment

Potential Impact	Installation Phase	O&M Phase	Decommissioning Phase	Cumulative Impacts	Transboundary Impacts
Benthic Ecology					
Temporary benthic habitat / species loss or disturbance	In		In	In	Out
Increased SSC and associated deposition (including mobilisation of potential contaminants)	In		In	In	Out
Increased risk of introduction of INNS	Out		Out	Out	Out
Accidental release of pollutants	Out		Out	Out	Out
Permanent benthic habitat / species loss or disturbance, and permanent change/alteration to substrata and habitats.		Out		Out	Out
Increased SSC and associated deposition		Out		Out	Out
Colonisation of hard structures		Out		Out	Out
Changes in physical processes from cable protection measures and the BLPs		Out		Out	Out
Impacts to benthic communities as a result of thermal load or EMF arising from the cable during operation		Out		Out	Out
Accidental release of pollutants		Out		Out	Out
Introduction and spread of INNS		Out		Out	Out
Marine Mammals					
Noise-related impacts (including physiological impacts, barrier effects and displacement) associated with installation noise: BLP piling	In		In	In	Out

ACRONYMS

Acronym	Definition
AA	Appropriate Assessment
AC	Alternating Current
AET	Apparent Effects Threshold
AIC	Abbreviates Incident Category
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
ASCOBANS	Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas
AtoN	Aids to Navigation
BAS	Burial Assessment Study
BBWF	Berwick Bank Wind Farm
BEIS	Department of Business, Energy and Industrial Strategy
BGS	British Geological Society
BLP	Bridge-Linked Platform
BODC	British Oceanographic Data Centre
BTO	British Trust for Ornithology
BWM	Ballast Water Management
CA	Cruising Association
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CBRA	Cable Burial Risk Assessment
CCS	Carbon Capture and Storage
CEA	Cumulative Effects Assessment
CEF	Cumulative Effects Framework
CEMP	Construction Environmental Management Plan
CES	Crown Estate Scotland/ Coastal East Scotland
CGNS	Celtic and Greater North Seas
CIA	Cumulative Impact Assessment
CifA	Chartered Institute for Archaeologists
CIRIA	Construction Industry Research and Information Association
CNS	Central North Sea

Acronym	Definition
CNSE	Central North Sea Electrification
CPA	Coastal Protection Act
CSEMP	Clean Seas Environment Monitoring Programme
CTD	Current, Temperature, Depth
DC	Direct Current
DCF	Data Collection Framework
DDV	Drop-Down Video
DECC	Department of Energy and Climate Change
DEFRA	Department for Environment, Food & Rural Affairs
ECIA	Ecological Impact Assessment
EEA	European Economic Area
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMF	Electromagnetic Field
EPS	European Protected Species
ERCoP	Emergency Response Cooperation Plan
ESCA	European Subsea Cable Association
ETAP	Eastern Trough Area Project
EU	European Union
EUNIS	European Nature Information System
FEAST	Feature Activity Sensitivity Tool
FEPA	Food and Environment Protection Act
FLO	Fisheries Liasion Officer
FLOWW	Fishing Liaison with Offshore Wind and Wet Renewables Group
FPSO	Floating Production Storage and Offloading
FSA	Formal Safety Assessment
GHG	Greenhouse Gas
GNS	Greater North Sea
HDD	Horizontal Directional Drilling
HER	Historic Environment Record
HES	Historic Environment Scotland
HMPA	Historic Marine Protected Area/

Acronym	Definition
HPMA	Highly Protected Marine Area
HPAIV	Highly Pathogenic Avian Influenza Virus A
HRA	Habitats Regulations Appraisal
HSE	Health, Safety and Environment
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IAMMWG	Inter-Agency Marine Mammal Working Group
IBTS	International Bottom Trawl Survey
ICCI	In combination climate impact
ICES	International Council for the Exploration of the Sea
ICOMOS	International Council of Monuments and Sites
ICPC	International Cable Protection Committee
IDP	Initial Decommissioning Plan
IEMA	Institute of Environmental Management and Assessment
IHLS	International Herring Larvae Survey
IMO	International Maritime Organisation
INNS	Invasive Non-Native Species
INTOG	Innovation and Targeted Oil & Gas
IUCN	International Union for Conservation of Nature
JNAPC	Joint Nautical Archaeology Policy Committee
JNCC	Joint Nature Conservation Committee
LAT	Lowest Astronomical Tide
LSE	Likely Significant Effect
MAIB	Major Accident Investigation Board
MARPOL	International Convention for the Prevention of Pollution from Ships
MBES	Multi-Beam Echo Sounder
MCA	Maritime and Coastguard Agency
MCAA	Marine and Coastal Access Act
MDAC	Methane Derived Authigenic Carbonate
MER	Maximising Economic Recovery
MFE	Mass-Flow Excavator
MGN	Marine Guidance Note

Acronym	Definition
MHWS	Mean High Water Springs
ML	Marine Licence
MLWS	Mean Low Water Springs
MMMP	Marine Mammal Mitigation Protocol
MMO	Marine Management Organisation
MOD	Ministry of Defence
MPA	Marine Protected Area
MPS	Marine Policy Statement
MD-LOT	Marine Directorate Licensing and Operations Team
MSA	Marine (Scotland) Act 2010
MSFD	Marine Strategy Framework Directive
MSL	Mean Sea Level
mT	Millitesla
MTS	Marine Traffic Survey
MU	Management Unit
MW	Megawatt
NAVTEX	Navigational Telex
NBN	National Biodiversity Network
NCMPA	Nature Conservation Marine Protected Area
NLB	Northern Lighthouse Board
NM	Nautical Mile
NRA	Navigational Risk Assessment
NRHE	National Record of the Historic Environment
NS	North Sea
NSTA	North Sea Transition Authority
NtM	Notice to Mariners
NVZ	Nitrate Vulnerable Zone
O&M	Operations and Maintenance
OBM	Oil-Based Muds
OCS	Offshore Convertor Station
OGA	Oil and Gas Authority
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
ORJIP	Offshore Renewables Joint Industry Programme

Acronym	Definition
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
OWSMRF	Offshore Wind Strategic Monitoring and Research Forum
PAC	Pre-Application Consultation
PAD	Protocol for Archaeological Discoveries
PDE	Project Design Envelope
PHA	Preliminary Hazard Analysis
PLGR	Pre-Lay Grapnel Run
PLONOR	Poses Little Or NO Risk
PMF	Priority Marine Feature
PNEC	Predicted No Effect Concentration
PSA	Particle Size Analysis
pUXO	Potential Unexploded Ordnance
PWA	Pipeline Works Authorisation
RBMP	River Basin Management Plan
RIAA	Report to Inform Appropriate Assessment
RIFG	Regional Inshore Fisheries Groups
RMP	Regional Marine Plans
RNLI	Royal National Lifeboat Institute
ROV	Remotely Operated Vehicle
RSPB	Royal Society for the Protection of Birds
RYA	Royal Yachting Association
SAC	Special Area of Conservation
SAR	Search and Rescue
SARH	Search and Rescue Helicopter
SCANS	Small Cetaceans in European Atlantic waters and the North Sea
SCOS	Special Committee on Seals
SEPA	Scottish Environment Protection Agency
SFF	Scottish Fishermen's Federation
SLVIA	Seascape, Landscape and Visual Impact Assessment
SMP	Seabird Monitoring Programme
SMRTS	Scottish Marine Recreation and Tourism Survey
SMU	Seal Management Units
SNCB	Statutory Nature Conservation Bodies

Acronym	Definition
SOLAS	Safety of Lives at Sea
SOPEP	Shipboard Oil Pollution Emergency Plans
SPA	Special Protection Area
SPL	Sound Pressure Level
SSC	Suspended Sediment Concentration
SSS	Side-Scan Sonar
SSSI	Site of Special Scientific Interest
SWFPA	Scottish White Fish Producers Association
THC	Total Hydrocarbon Content
TJB	Transition Joint Bay
UKBAP	UK Biodiversity Action Plan
UKCP	UK Climate Projections
UKCS	UK Continental Shelf
UKFEN	UK Fisheries Economic Network
UKHO	UK Hydrographic Office
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UXO	Unexploded Ordnance
VMS	Vessel Management System
WFD	Water Framework Directive
WSI	Written Scheme of Investigation
ZoI	Zone of Influence